User and Reference Manual

ALTOVA®

Altova UModel User Manual

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UModel

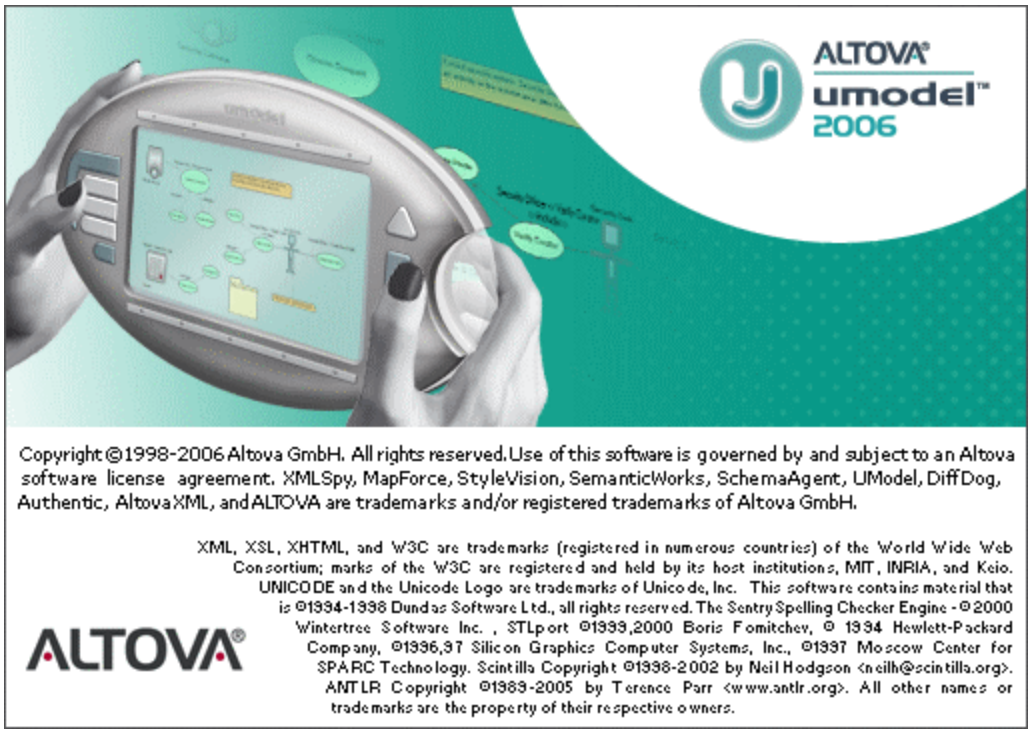
1 UModel

UModel™ 2006 is an affordable UML modeling application with a rich visual interface and superior usability features to help level the UML learning curve, and includes many high-end functions to empower users with the most practical aspects of the UML 2.1 specification.

UModel™ 2006 supports:

- context sensitive entry helpers
- syntax coloring in diagrams
- cascading styles
- customizable design elements
- unlimited Undo and Redo
- sophisticated Java and C# code generation from models
- reverse engineering of existing Java, C# source code
- complete round-trip processing allowing code and model merging
- XMI version 2.1 model import and export

These capabilities allow developers, including those new to software modeling, to quickly leverage UML to enhance productivity and maximize their results.



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Chapter 2

Introducing UModel

2 Introducing UModel

The UML is a complete modeling language but does not discuss, or prescribe, the methodology for the development, code generation and round-trip engineering processes. UModel has therefore been designed to allow complete flexibility during the modeling process:

- UModel diagrams can be created in any order, and at any time; there is no need to follow a prescribed sequence during modeling.
- Code, or model merging can be achieved at the project, package, or even class level. UModel does not require that pseudo-code, or comments in the generated code be present, in order to accomplish round-trip engineering.
- Code generation is customizable: the code-generation in UModel is based on SPL templates and is, therefore, completely customizable. Customizations are automatically recognized during code generation.
- Code generation and reverse-engineering currently support Java versions 1.4.x and 5.0, as well as C# versions 1.2 and 2.0. A single project can support both Java and C# code simultaneously.
- Support for UML templates and generics.
- XML Metadata Interchange (XMI version 2.1) for UML 2.0 or 2.1.
- When adding properties, or operations UModel provides in-place entry helpers to choose types, protection levels, and all other manner of properties that are also available in industrial-strength IDEs such as XMLSpy, Visual Studio .Net or Eclipse.
- Syntax-coloring in diagrams makes UML diagrams more attractive and intuitive.
- Modeling elements and their properties (font, colors, borders etc.) are completely customizable in an hierarchical fashion at the project, node/line, element family and element level.
- Customizable actors can be defined in use-case diagrams to depict terminals, or any other symbols.
- Modeling elements can be searched for by name in the Model diagram tab, Model Tree pane, Messages and Documentation windows.
- Class, or object associations, dependencies, generalizations etc. can be found/highlighted in model diagrams through the context menu.
- The unlimited levels of Undo/Redo track not only content changes, but also all style changes made to any model element.

Please note:

This document does not attempt to describe, or explain, the Unified Modeling Language (UML); it describes how to use the UModel modeling application, to model code and achieve round-trip engineering results.

Chapter 3

UModel tutorial

3 UModel tutorial

This tutorial describes, and follows, the general sequence used when creating a modeling project in UModel.

The major portion of the tutorial deals with the forward-engineering process, i.e. using UModel to create UML diagrams and generate code as the precursor to the round-trip engineering sections that follow. The round-trip engineering sections, describe the process from both code and model vantage points.

The tutorial describes the following UML diagrams, and how to manipulate the various modeling elements within them. The following diagrams and follow-on tasks are discussed:

Forward engineering process:

- Use cases
- Class diagrams
- Object diagrams
- Component diagrams
- Deployment diagrams

Round-trip process (model - code - model)

- Code generation from UModel
- Add a new operation to the external code
- Merge the external code back into UModel.

Round-trip process (code - model - code)

- Import code produced by XMLSpy from a directory (or from a project file)
- Add a new class to the generated model in UModel
- Merge the updated project with the external code.

The examples used in the tutorial are available in your installation folder under: **UModel2006 \UModelExamples**.

BankView-start.ump
is the UModel project file that constitutes the initial state of the tutorial sample. Several model diagrams as well as classes, objects, and other model elements exist at this stage. Working through the tutorial adds new packages, model diagrams and many other elements that will acquaint you with the ease with which you can model applications using UModel. Please note that the syntax check function reports errors and warnings on this file, the tutorial shows you how to resolve these issues.

BankView-finish.ump
is the UModel project file that constitutes final state of the tutorial sample, if you have worked through it step by step. This project file is the one used when generating code and synchronizing it with UModel.

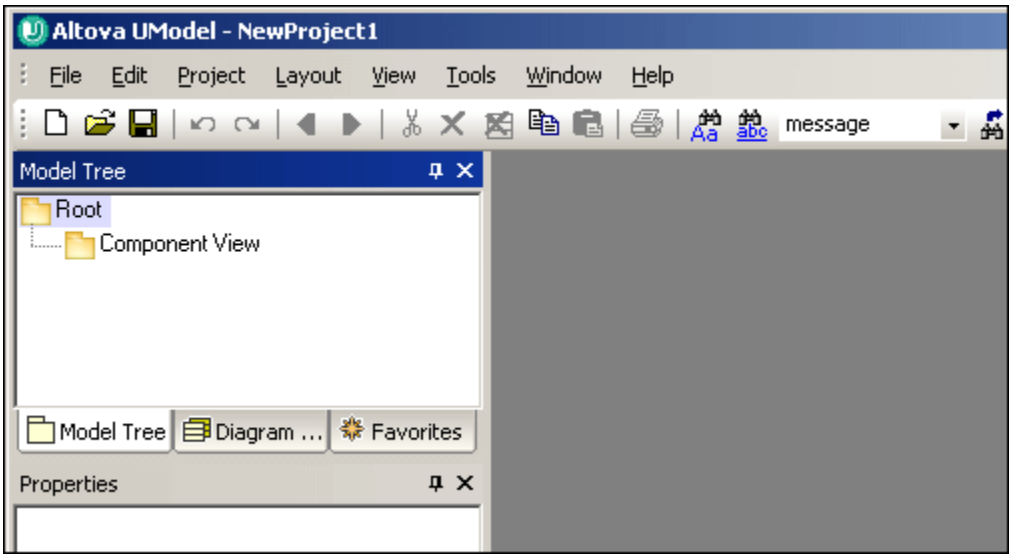
- The **OrgChart.zip** file supplied in the folder is used for the round-trip engineering process. Please unzip it in the ...\UModelExamples folder before starting the section.

Additional example files for both **Java** and **C#** programming languages are also available in the same directory, i.e. **Bank_Java**.ump, **Bank_CSharp**.ump and **Bank_MultiLanguage**.ump. These project files also contain Sequence diagrams which are described later in this documentation.

3.1 Starting UModel

Having installed UModel on your computer:

1. Start UModel by double-clicking the UModel icon on your desktop, or use the **Start | All Programs** menu to access the UModel program.
   UModel is started with a default project "NewProject1" visible in the interface.

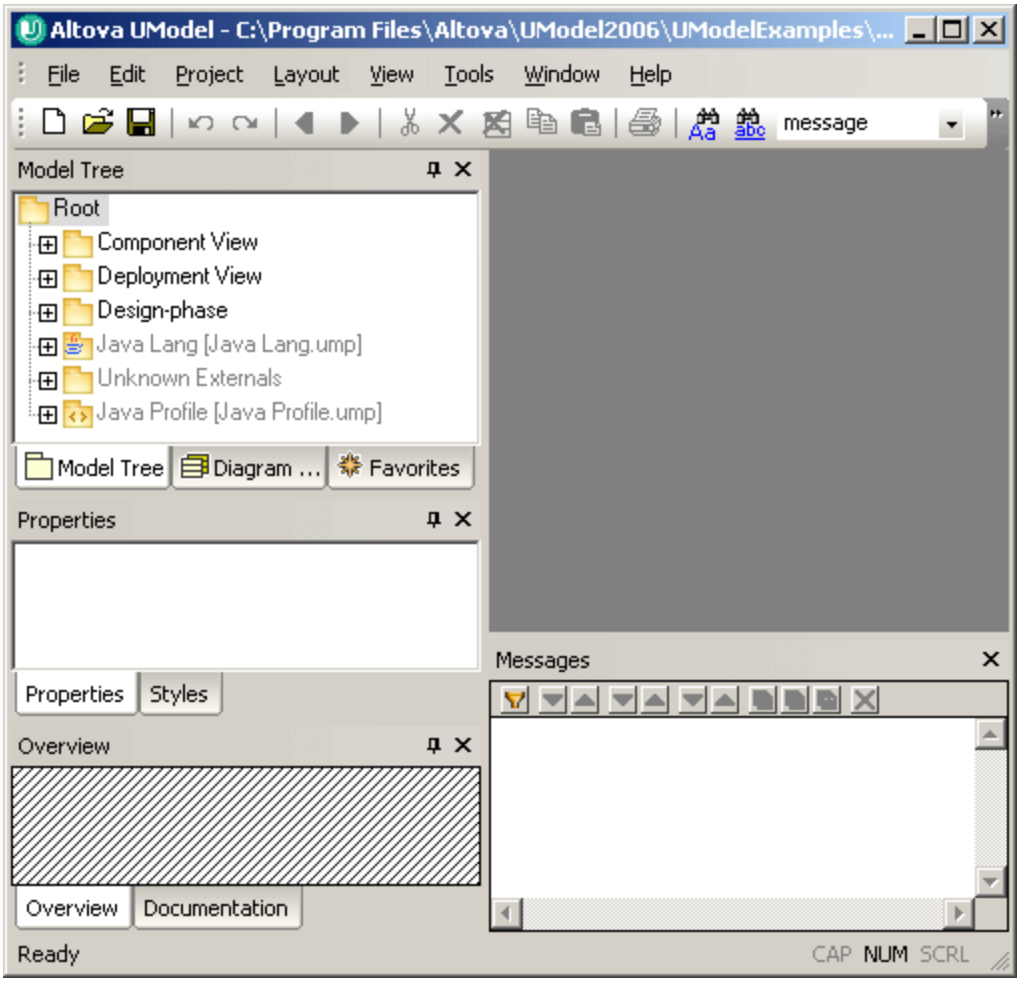


   Note the major parts of the user interface: the three panes on the left hand side and the empty diagram pane at right.

   Two default packages are visible in the Model Tree tab, "Root" and "Component View". These two packages cannot be deleted or renamed in a project.

To open the BankView-start project:

1. Select the menu option **File | Open** and navigate to the ...\UModelExamples folder of UModel.
2. Open the **BankView-start.ump** project file.
   The project file is now loaded into UModel. Several predefined packages are now visible under the Root package.



The Model Tree pane supplies you with various views of your modeling project:

- The **Model Tree** tab contains and displays all modeling elements of your UModel project. Elements can be directly manipulated in this tab using the standard editing keys as well as drag and drop.
- The **Diagram Tree** tab allows you quick access to the modeling diagrams of you project wherever they may be in the project structure. Diagrams are grouped according to their diagram type.
- The **Favorites** tab is a user-definable repository of modeling elements. Any type of modeling element can be placed in this tab using the "Add to Favorites" command of the context menu.

The Properties pane supplies you with two views of specific model properties:

- The **Properties** tab displays the properties of the currently selected element in the Model Tree pane or in the Diagram tab. Element properties can defined or updated in this tab.
- The **Styles** tab displays attributes of diagrams, or elements that are displayed in the Diagram view. These style attributes fall into two general groups: Formatting and display settings.

The Overview pane displays two tabs:

- The **Overview** tab, which displays an outline view of the currently active diagram
- The **Documentation** tab which allows you to document your classes on a per-class basis.

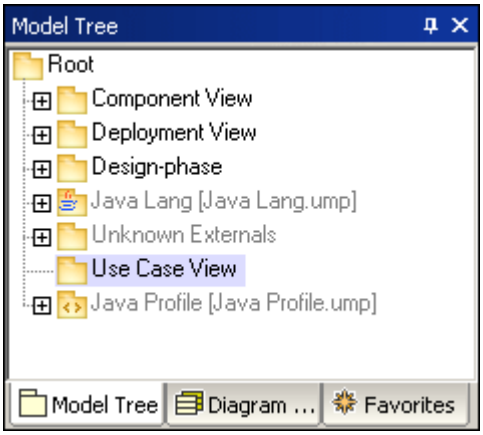
3.2 Use cases

The aim of this tutorial section is to:

- Add a new **package** to the project
- Add a new Use Case **diagram** to the project
- Add use case **elements** to the diagram, and define the dependencies amongst them
- Align and size elements in the diagram tab.

To add a new package to a project:

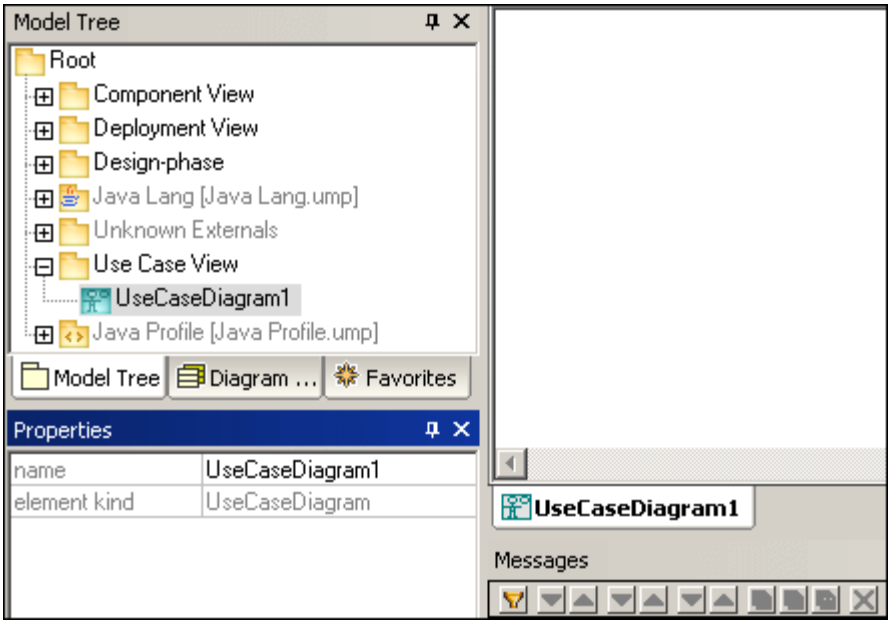
1. Right click the **Root** package in the Model Tree tab, and select **New | Package**.
2. Enter the name of the new package e.g. **Use Case View**, and press Enter.



Please see Packages for more information on packages and their properties.

Adding a diagram to a package:

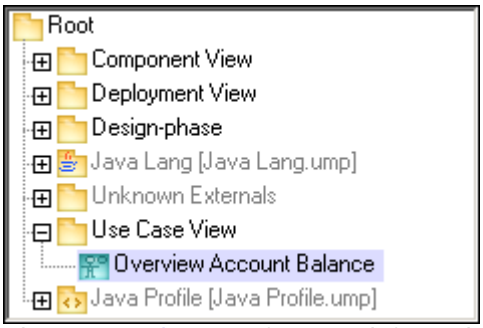
1. Right click the previously created Use Case View package.
2. Select **New | UseCase Diagram**.



A Use Case diagram has now been added to the package in the Model Tree view, and a diagram tab has been created in the diagram pane. A default name has been

provided automatically.

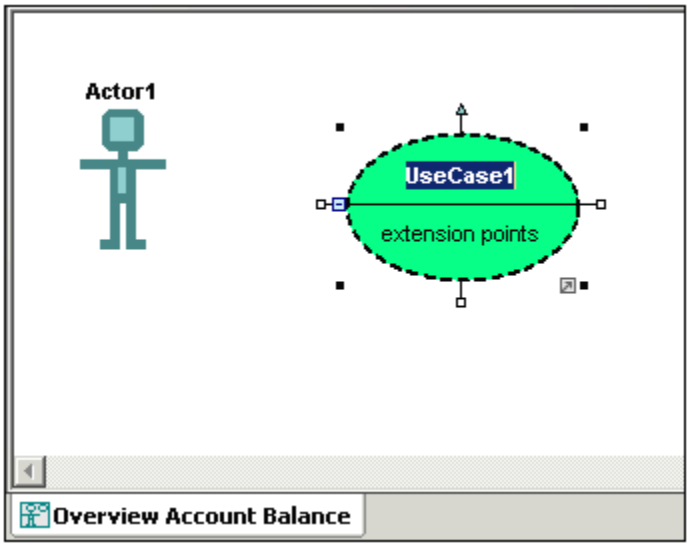
3. Double click the supplied name, in the Model Tree tab, change it to "Overview Account Balance", and press Enter to confirm.



Please see Diagrams for more information on diagrams and their properties.

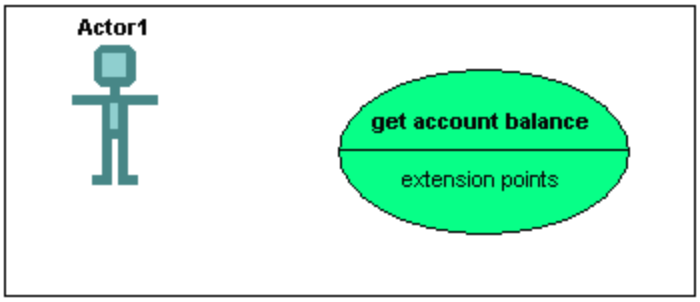
Adding Use case elements to the Use Case diagram:

1. Right click in the newly created diagram and select **New | Actor**.
   The actor element is inserted at the click position.
2. Click the Use Case icon  in the icon bar and click in the diagram tab to insert the element.
   A UseCase1 element is inserted. Note that the element, and its name, are currently selected, and that its properties are visible in the Properties tab.



3. Change the title to "get account balance", press Enter to confirm. Double click the title if it is deselected.

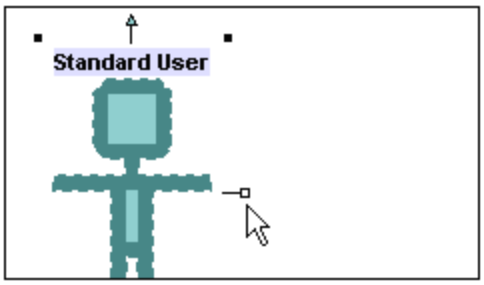
   Note that the use case is automatically resized to adjust to the text length.



Model elements have various connection handles and other items used to manipulate it.

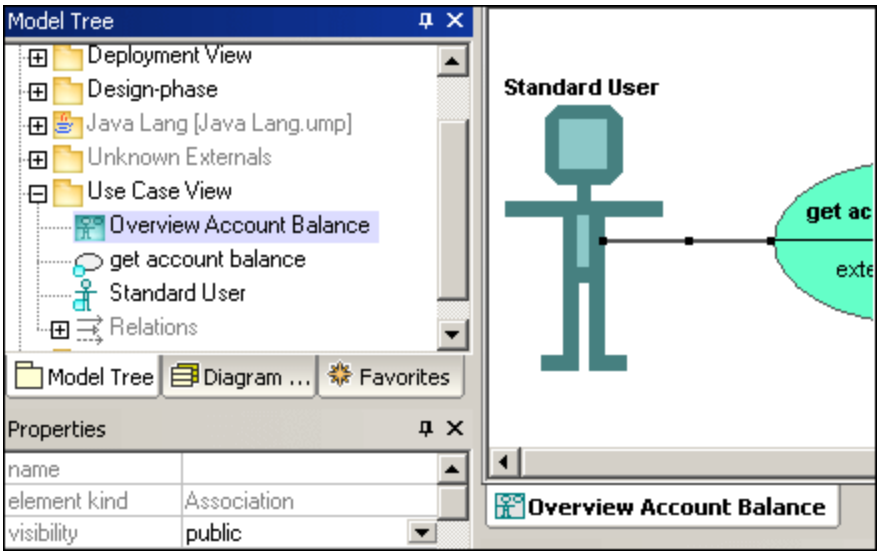
Manipulating UModel elements: handles and compartments

1. Double click the Actor1 text, of the Actor element, change the name to "Standard User" and press Enter to confirm.
2. Place the mouse cursor over the "**handle**" to the right of the actor.
   A tooltip containing "Association" appears.



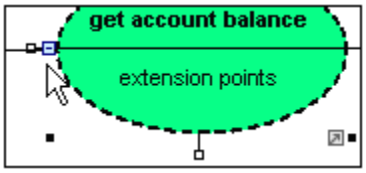
3. Click the handle, drag the Association line to the right, and drop it on the "get account balance" use case.

   An association has now been created between the actor and the use case. The association properties are also visible in the Properties tab. The new association has been added to Model Tree under the Relations item of the Use Case View package.

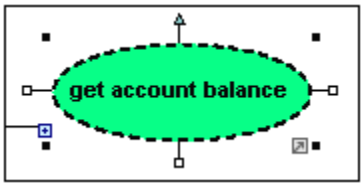


4. Click the use case and drag it to the right to reposition it.
   The association properties are visible on the association object.
5. Click the use case to select it, then click the collapse icon on the left hand edge of the

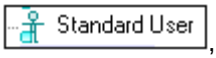
use case ellipse.



The extension points compartment is now hidden.



Please note:

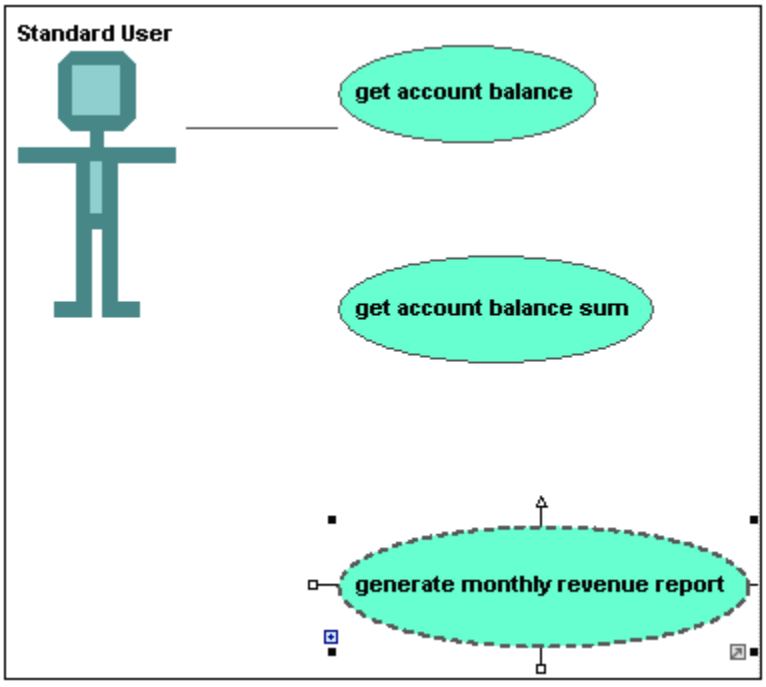
A blue dot next to an element icon 

, in the Model Tree tab, signifies that the element is visible in the current diagram tab. Resizing the actor adjusts the text field which can be multi line. A line break can be inserted into the text using CTRL+Enter.

Finishing up the use case diagram:

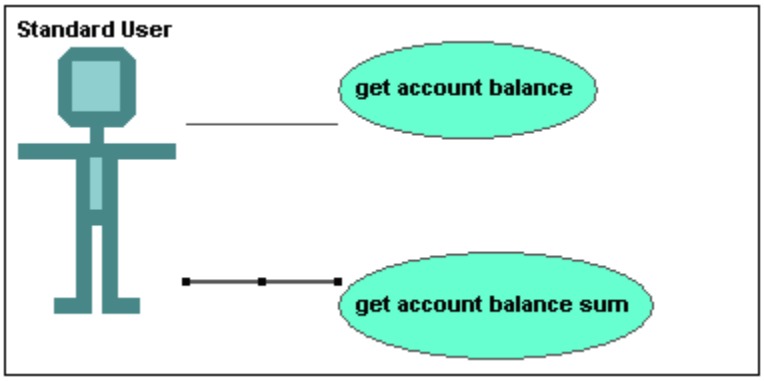
Using the methods discussed above:

1. Click the Use Case icon in the icon bar and **simultaneously** hold down the CTRL keyboard key.
2. Click at two different vertical positions in the diagram tab to add two more use cases, then release the CTRL key.
3. Name the first use case "get account balance sum" and the second, "generate monthly revenue report".
4. Click on the collapse icon of each use case to hide the extensions compartment.



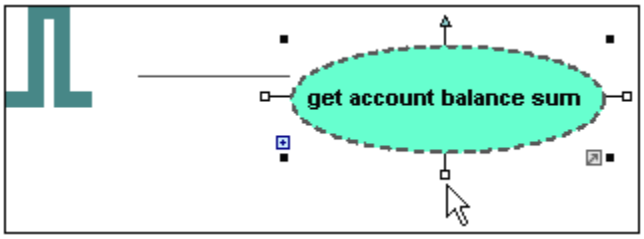
5. Click the actor and use the association handle to create an association between

Standard user and "get account balance sum".

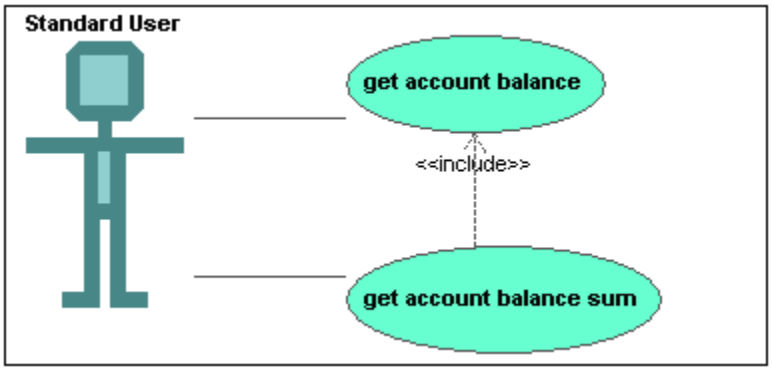


To create an "Include" dependency between use cases (creating a subcase):

1. Click the **Include** handle of the "get account balance sum" use case, at the bottom of the ellipse, and drop the dependency on "get account balance".



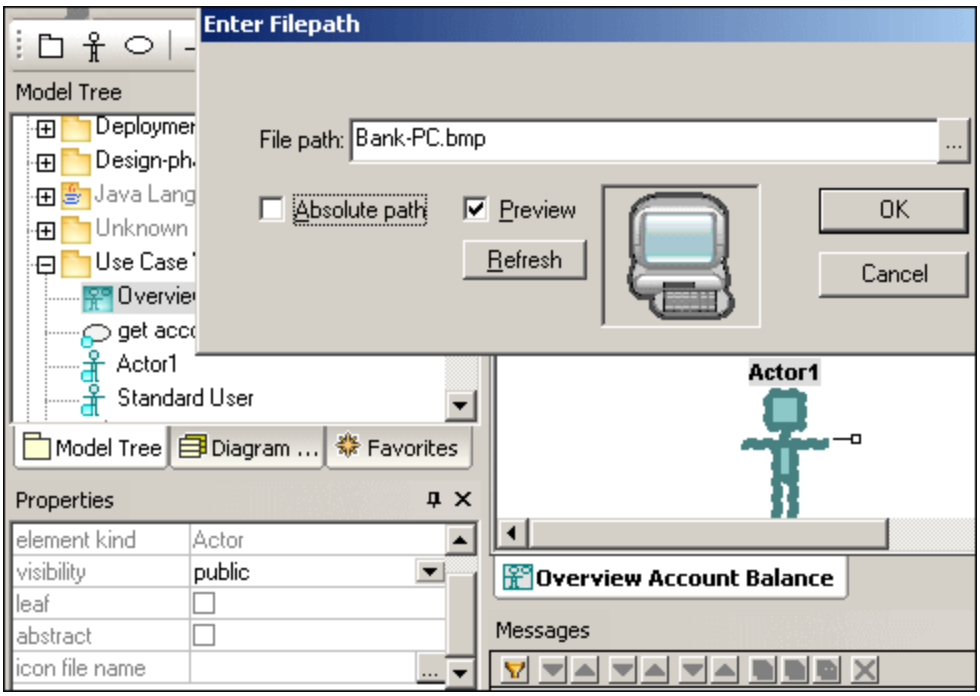
An "include" dependency is created, and the include stereotype is displayed on the dotted arrow.



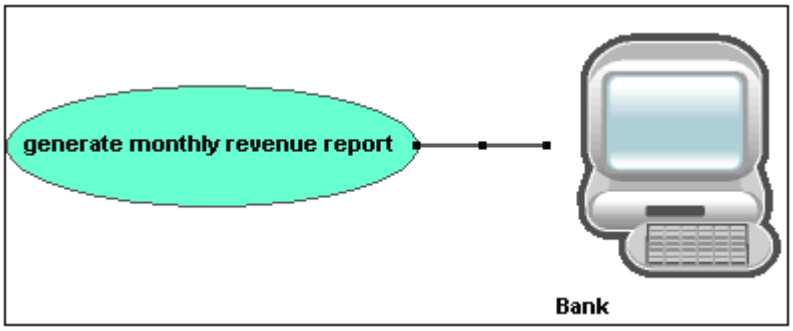
Inserting user-defined actors:

The actor in the "generate monthly revenue report" use case is not a person, but an automated batch job run by a Bank computer.

1. Insert an actor into the diagram using the Actor icon in the icon bar.
2. Rename the actor to Bank.
3. Move the cursor over to the Properties tab, and click the browse icon next to the "icon file name" entry.
4. Click the Browse icon to select the user-defined bitmap, Bank-PC.bmp.
5. Deselect the "Absolute Path" check box to make the path relative. Preview displays a preview of the selected file in the dialog box.



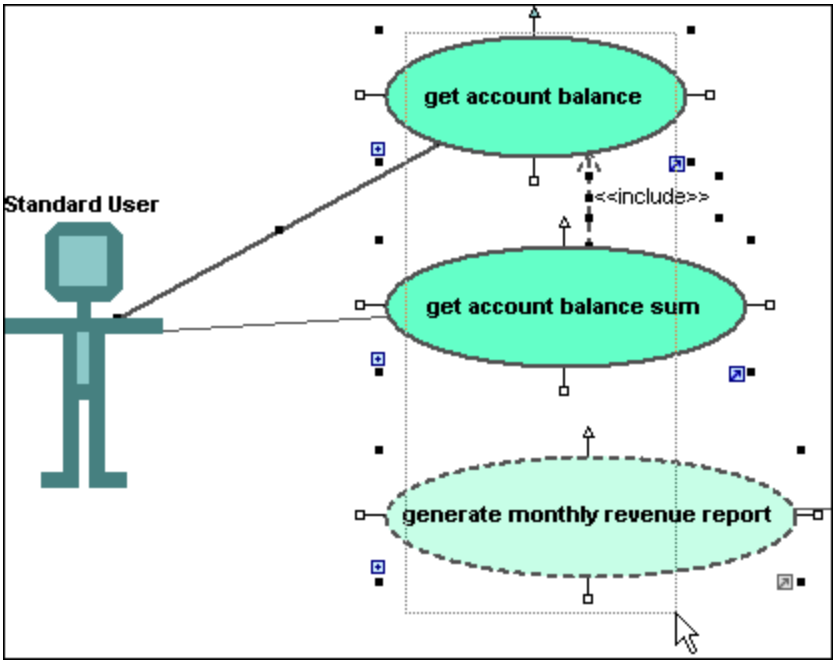
6. Click OK to confirm the settings and insert the new actor.
7. Move the new Bank actor to the right of the lowest use case.
8. Click the Association icon  in the icon bar and drag from the Bank actor to the "generate monthly revenue report" use case.
   This is an alternative method of creating an association.



Please note:
The background color used to make the bitmap transparent has the RGB values 82.82.82.

Aligning and adjusting the size of elements:

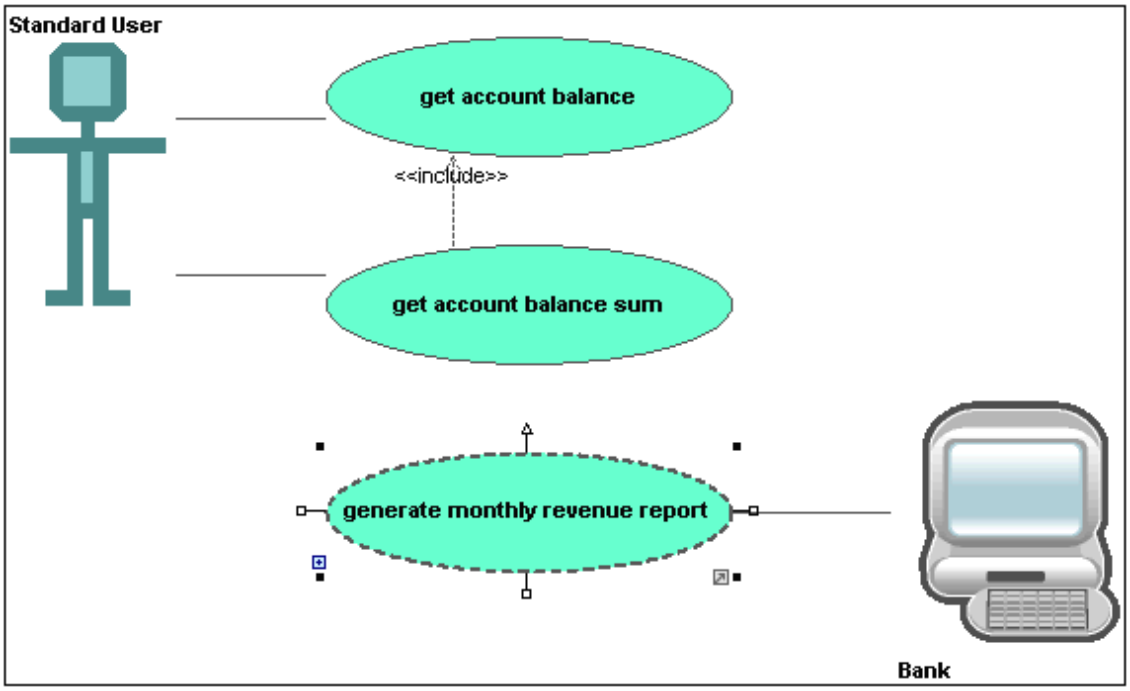
1. Create a selection marquee by dragging on the diagram background, making sure that you encompass all three use cases starting from the top.
   Note that the last use case to be marked, is shown in a dashed outline in the diagram, as well as in the Overview window.



All use cases are selected, with the lowest being the basis for the following adjustments.

2. Click the Make same size icon  in the title bar.
3. Click the Center Horizontally icon  to line up all the ovals.
   The use case elements are all centered and of the same size.

Please note:
You can also use the CTRL key to select multiple elements.



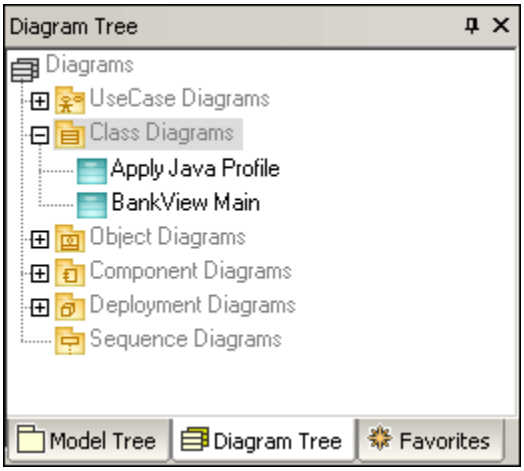
3.3 Class Diagrams

1. The aim of this tutorial section is to:

- Add a new abstract class called Account, as well as attributes and operations
- Create a **composite** association from Bank to Account

To open a different diagram in UModel:

1. Click the Diagram Tree tab.
2. Expand the Class Diagrams package to see its contents.

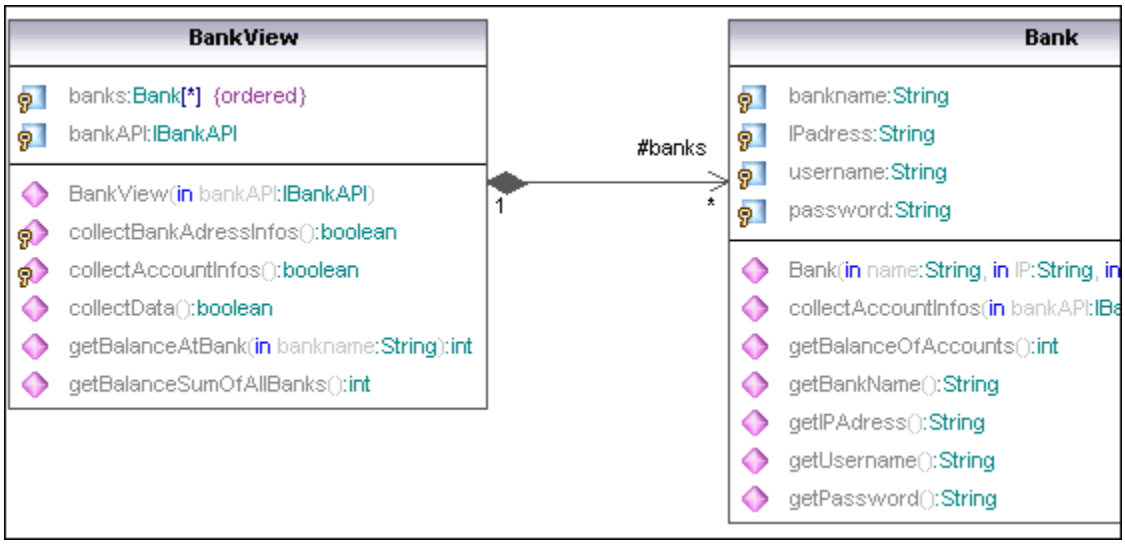


All class diagrams contained in the project are displayed.

3. Double click the **BankView Main** diagram icon.
The Class diagram appears as a tab in the working area.

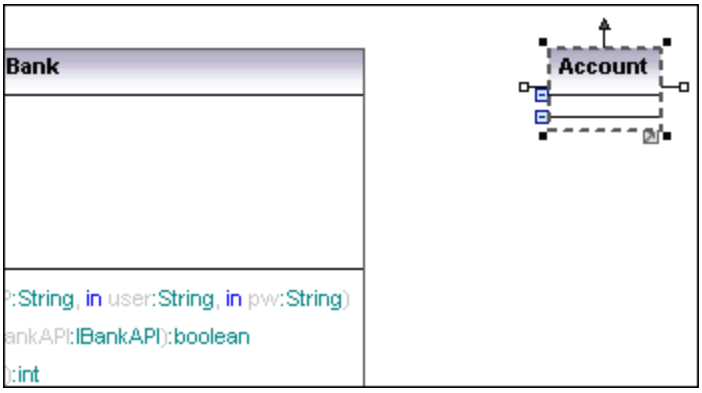
Please note:
You could of course, double click the Class diagram icon in the Model Tree tab below the BankView package to achieve the same thing.

Two concrete classes with a composite association between them, are visible in the class diagram.



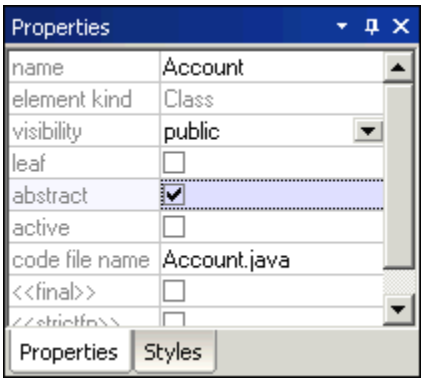
To add a new class and define it as abstract:

1. Click the class icon  in the icon bar, then click to the right of the Bank class to insert it.
2. Change the Class1 name to e.g. "**Account**", press Enter to confirm, (double click the name if it becomes deselected).

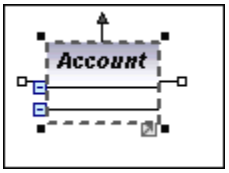


Note that the Properties tab displays the current class properties.

3. Click the "**abstract**" check box in the Properties pane to make the class abstract.
4. Click in the "code file name" text box, and enter **Account.java** to define the Java class.

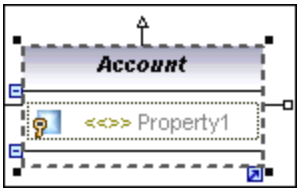


The class title is now displayed in italic, which is the identifying characteristic of abstract classes.

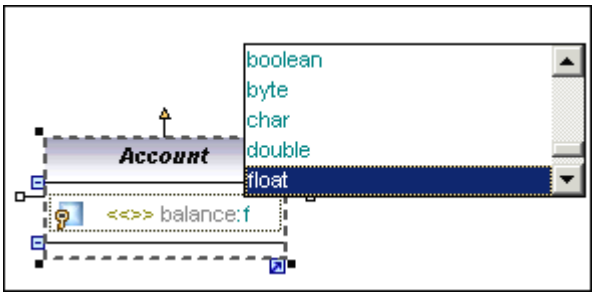


To add properties to a class:

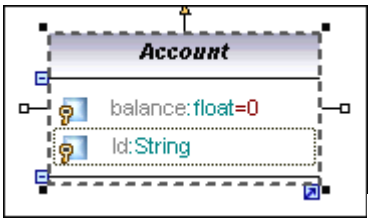
1. Right click the Account class and select **New | Property,** or press the **F7** key**.**
   A default property "Property1" is inserted with stereotype identifiers << >>.



2. Enter the Property name "**balance**", and then add a colon character "**:**".
   A dropdown list containing all valid types is displayed.
3. Enter the "**f**" character through the keyboard, and press Enter to insert the return value datatype "float".
   Please note that drop-down lists are case sensitive!

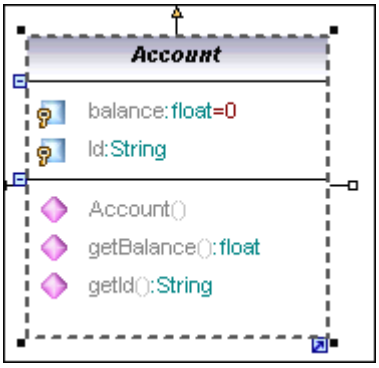


4. Continue on the same line by appending "**=0**" to define the default value.
5. Press the **F7** keyboard key to add a second property to the class.
6. Enter **Id**: and select **String** from the dropdown list.



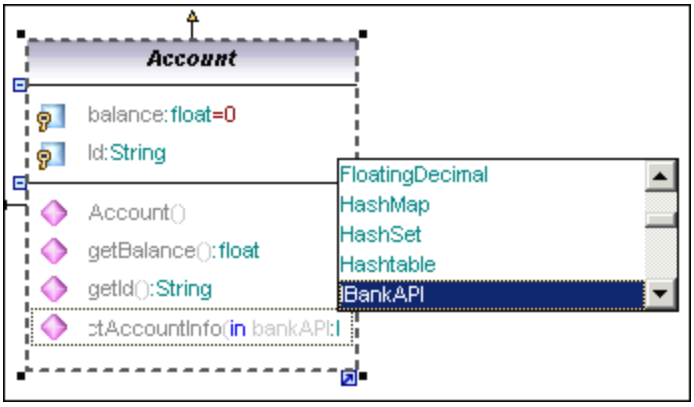
To add operations to a class:

1. Right click the Account class and select **New | Operation**, or press the **F8** key.
2. Enter **Account()** as the constructor.
   Using the method described above:
3. Add two more operations namely **getBalance:float** and **getId:String**.

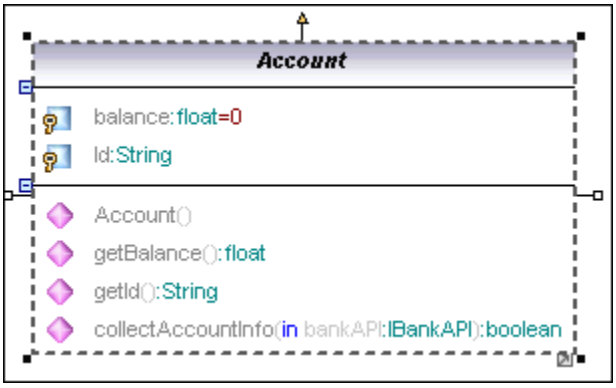


Using the **autocomplete function** while defining operations:

4. Create another operation, using F8, **collectAccountInfo** and enter the open parenthesis character "**(**".
   Entering the "i" character opens the dropdown list allowing you to select one of the operation direction parameters: in, inout, or out.
5. Select "in" from the dropdown list, enter a "space" character, and continue editing on the same line.
6 Enter "bankAPI" and then a colon.
7. Select **IBankAPI** from the dropdown list, add the close parenthesis character "**)**", and enter a colon ":".



8. Press the "b" key to select the boolean datatype, then Enter to insert it.
9. Press Enter to end the definition.



Please note:

Clicking the **visibility icon** to the left of an operation, or property, opens a dropdown list enabling you to change the visibility status.

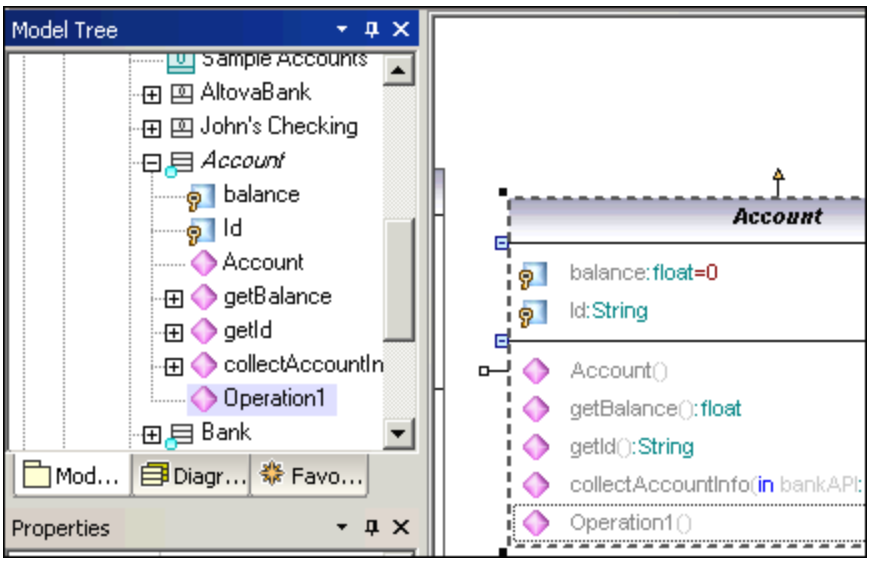
Deleting class properties and operations from a class diagram:

1. Press F8 then Enter, to add a default operation "Operation1" in the Account class.
2. Right click Operation1.
3. Select the menu entry "**Delete Operation1 from Account**".
   Operation1 is deleted from the **class** as well as from the **project**.

Deleting (finding) class properties and options from the Model Tree:

Properties and options can also be deleted directly from the Model Tree. To do this safely, it is important to first find the correct property. Assuming you have inserted "Operation1" in the Account class (press F8, then Enter to insert):

1. Right click Operation1 in the Account class.
2. Select the option "**Select in Model Tree**".
   The Operation1 item is now highlighted under *Account* in the Model Tree tab.



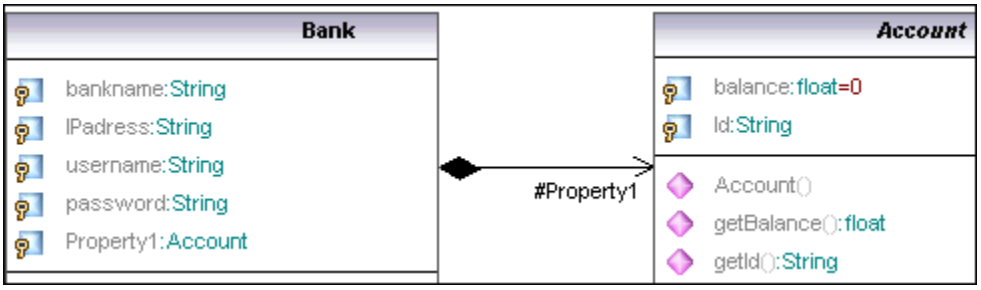
3. Press the **Del** key to delete the operation from the **class** and **project!**

Please note:

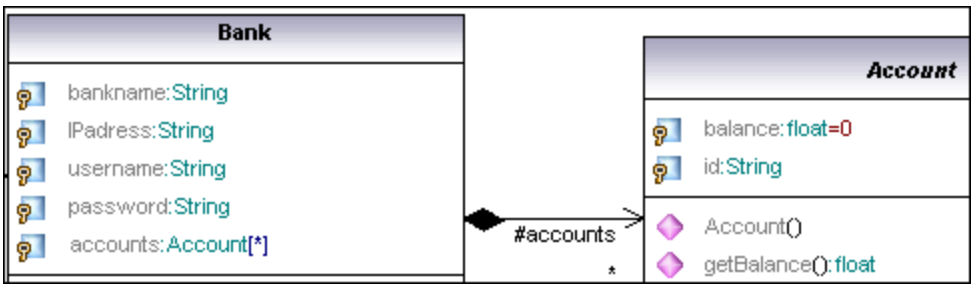
Make sure that the operation is selected in the **Model Tree** when deleting, or you will delete the whole class from the project. Undo can correct any number of mishaps at any time, however.

Creating an composition association between the Bank and Account classes:

1. Click the Composition icon  in the title bar, then drag from the **Bank** class to the **Account** class. The class is highlighted when the association can be made.
   A new property (**Property1:Account**) is created in the Bank class, and an composite association arrow joins the two classes.



2. Double click the new **Property1** entry in the Bank class and change it to "**accounts**", being sure not to delete the Account type definition (displayed in teal/green).
3. Press the End keyboard key to place the text cursor at the end of the line, and
4. Enter the open square bracket character "**[**" and select "*****" from the dropdown list, to define the **multiplicity**, and press Enter to confirm.



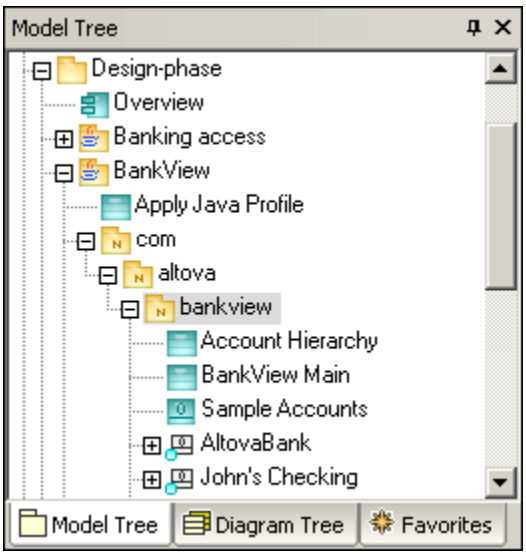
3.3.1 Creating derived classes

The aim of this tutorial section is to:

- Add a new **Class diagram** called Account Hierarchy to the project
- Insert existing classes, and create a new Savings account class
- Create three **derived** classes of the abstract base class Account, using Generalizations

To create a new Class Diagram:

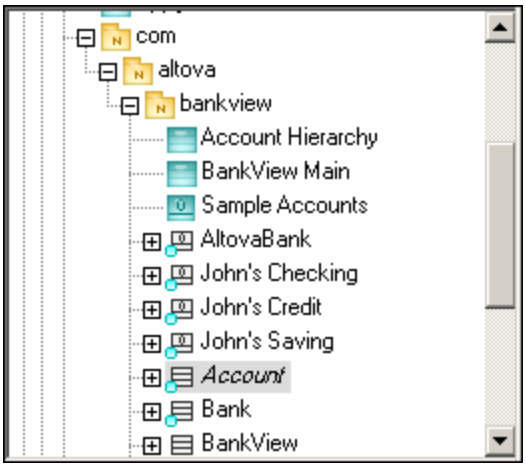
1. Right click the bankview **package** (under **Design-phase | BankView | com | altova**) in the Model Tree tab, and select **New | Class Diagram.**
2. Double click the new ClassDiagram1 entry and rename it to "Account Hierarchy", and press Enter to confirm.



The Account Hierarchy tab is now visible in the working area.

Inserting existing classes into a diagram:

1. Click the *Account* **class** in the BankView **package** (under **com | altova | bankview**), and

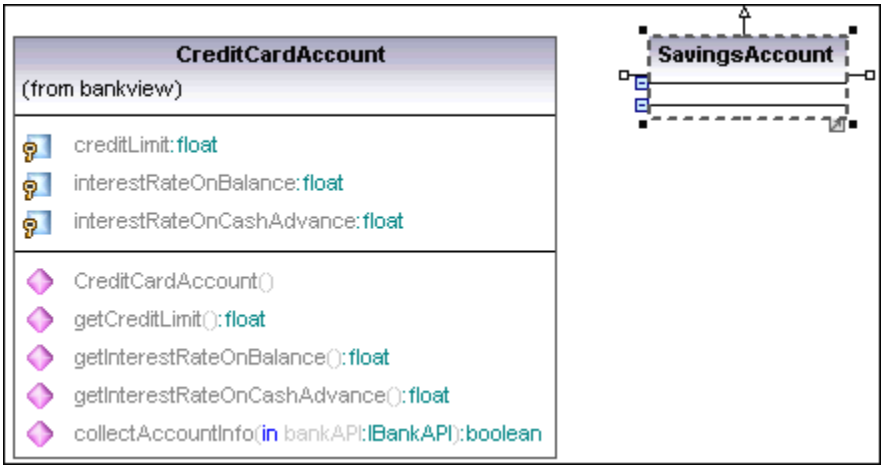


2. Drag it into the Account Hierarchy tab.
3. Click the **CheckingAccount** class (of the same package) and drag it into the tab.
4. Place the class below and to the left of the Account class.

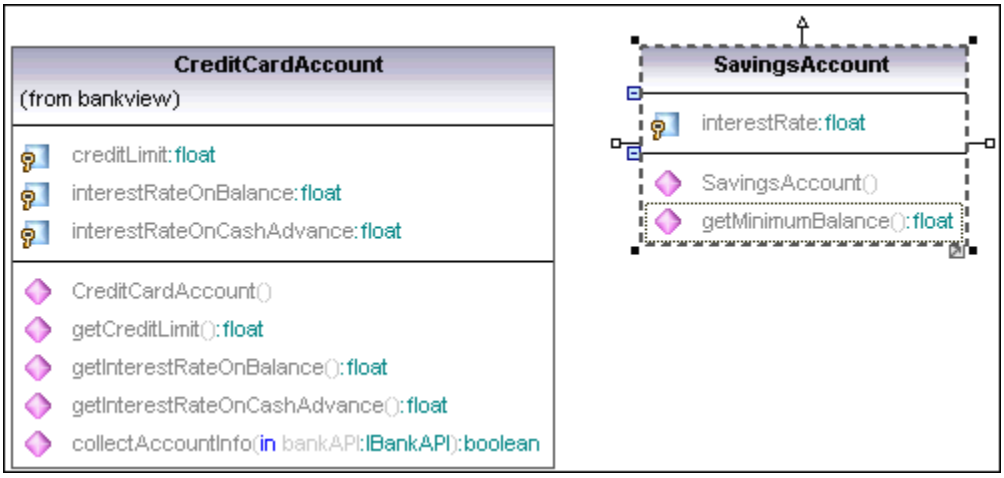
5. Use the same method to insert the **CreditCardAccount** class. Place it to the right of the CheckingAccount class.

Adding a new class:

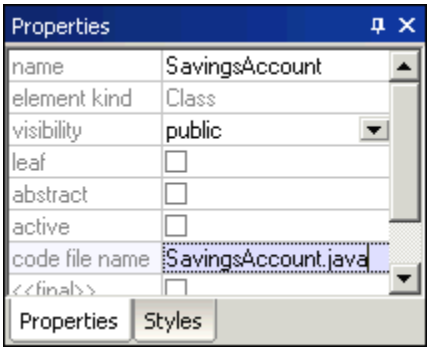
1. Right click the diagram background (to the right of CreditAccountClass) and select **New | Class**.
   A new class is automatically added to the correct package, i.e. BankView which contains the current class diagram **Account Hierarchy**.
2. Double click the class name and change it to **SavingsAccount**.



3. Press the **F7** key to add a new **property**.
4. Enter "**interestRate**", then a colon, and press "**f**" to select the float datatype from the dropdown list and press Enter twice to select and confirm the entry.
5. Press **F8** and add the **operation**/constructor **SavingsAccount()**.
6. Use the same method, F8, to add the operation **getMinimumBalance:float**.



7. Click in the "code file name" text box, in the Properties tab, and enter **SavingsAccount.java** to define the Java code class.

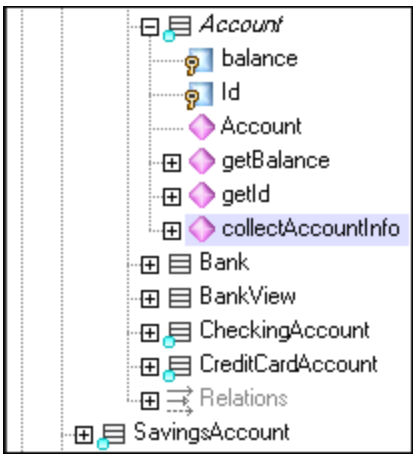


Reusing/copying existing Properties/Operations:

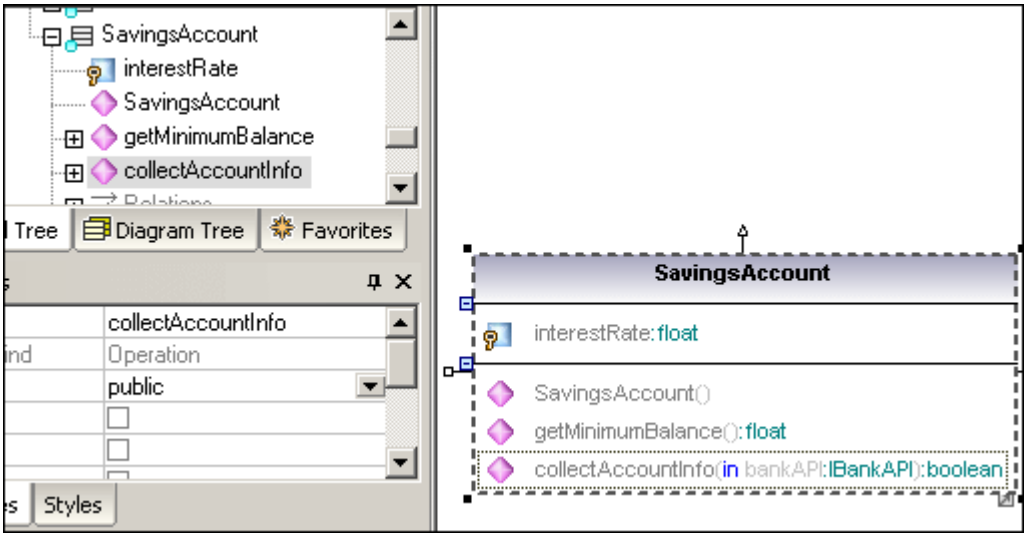
Properties and operations can be directly copied, or moved, from one class to another. This can be achieved using drag and drop, as well as the standard keyboard shortcuts:

- within a **class** in the diagram tab
- between **different** classes in the diagram tab
- in the Model Tree view
- between different UML diagrams, by dropping the copied data onto a different diagram tab.
  Please see "Cut, copy and paste in UModel Diagrams" for more information.

1. Expand the ***Account*** class in the **Model Tree**.
2. Right click the **collectAccountInfo** operation and select **Copy**.



3. Right click the **SavingsAccount** class in the Model Tree and select **Paste**.
   The operation is copied into the SavingsAccount class, which is automatically expanded to display the new operation.



   The new operation is now also visible in the SavingsAccount class in the Class Diagram.

Please note:

You can use the Copy/Paste keyboard shortcuts (CTRL X, C, or V), as well as drag and drop in the Model Tree to achieve the same effect. You might have to disable the sort options to drop the operation between specific items.

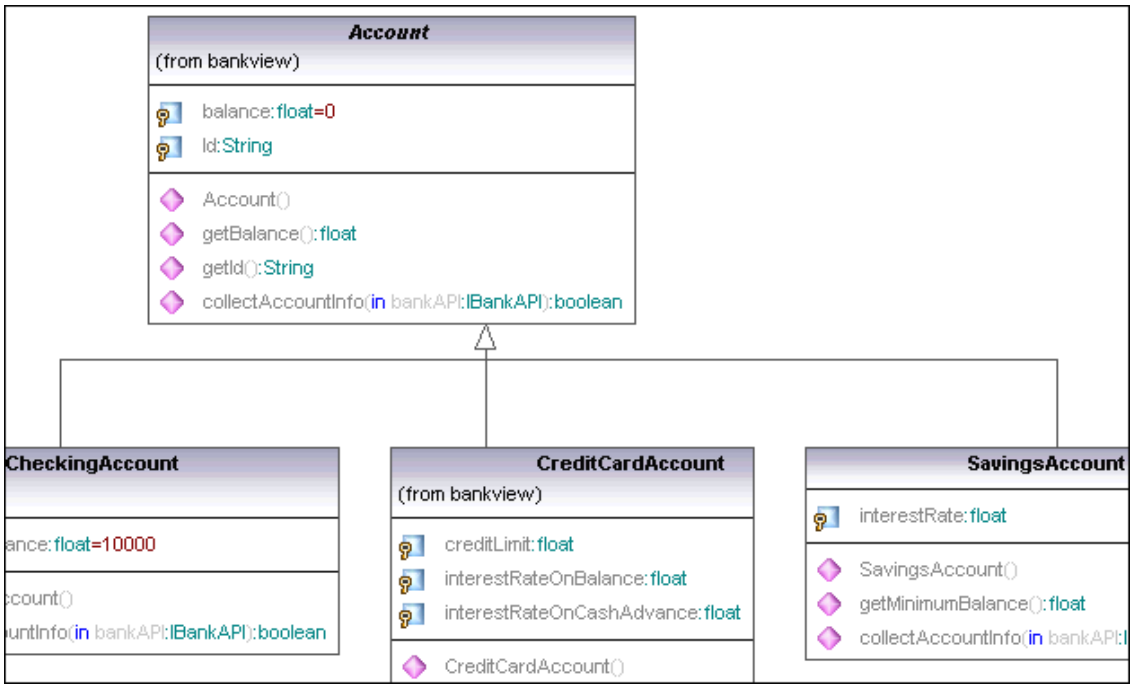
Creating derived classes - Generalization/Specialization:

At this point the class diagram contains the abstract class, Account, as well as three specific Account classes. We now want to define, or create a generalization/specialization relationship between Account and the specific classes i.e. to create three derived concrete classes.

1. Click the Generalization icon  in the icon bar and **hold down** the **CTRL** key.
2. Drag from **CreditCardAccount** (the class in the middle) and drop on the Account class.
3. Drag from the **CheckingAccount** class and drop the **arrowhead** of the previously created generalization.
4. Drag from the **SavingsAccount** class and drop the arrowhead of the previously created

generalization: release the CTRL key at this point.

5. Generalization arrows are created between the three subclasses, and the Account superclass.



3.4 Object Diagrams

The aim of this tutorial section is to:

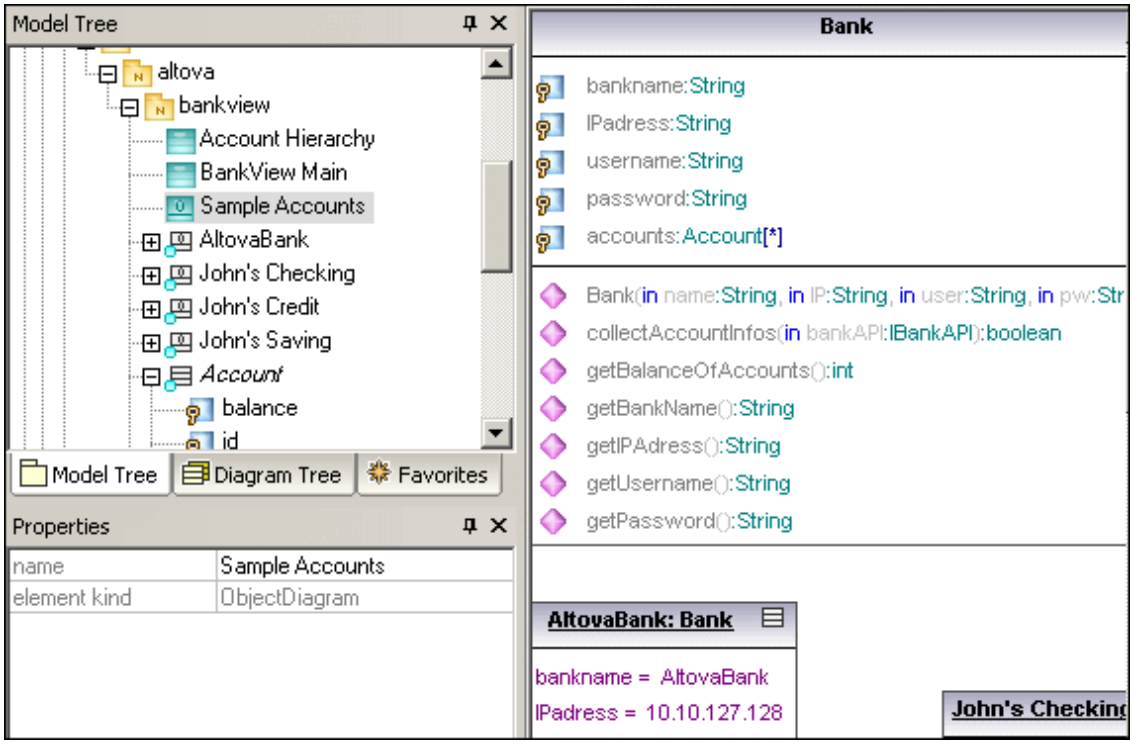
- Show how **class** and **object** diagrams can be combined in one diagram, to give you a snapshot of the objects at a given point of time
- Create **Objects/Instances** and define the relationships between them
- Format association/links
- Enter real-life data into objects/instances

To open the Object diagram:

1. Double click the **Sample Accounts** diagram icon under the **bankview** package (or under Object Diagrams in the Diagram Tree tab).

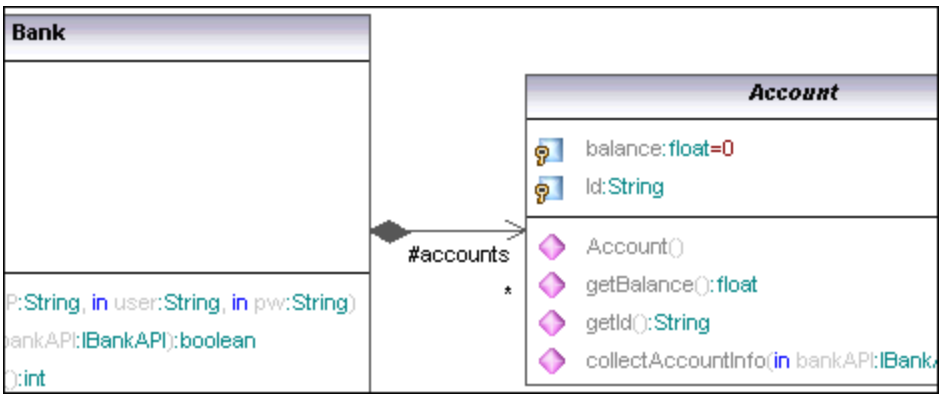
   The Bank class and two related objects/instances are displayed in the object diagram.

   AltovaBank:Bank is the object/instance of the Bank class, while **John's checking: CheckingAccount** is an instance of the class CheckingAccount.



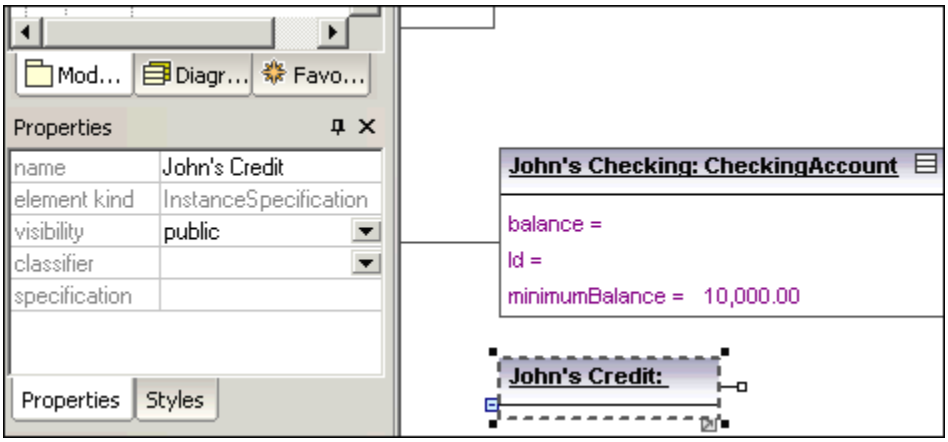
Inserting a class into an Object diagram:

- Click the *Account* class icon *Account* in the **Model Tree**, and drag it into the "Sample Accounts" tab.
  The composite association defined previously, in BankView Main diagram, is automatically created.



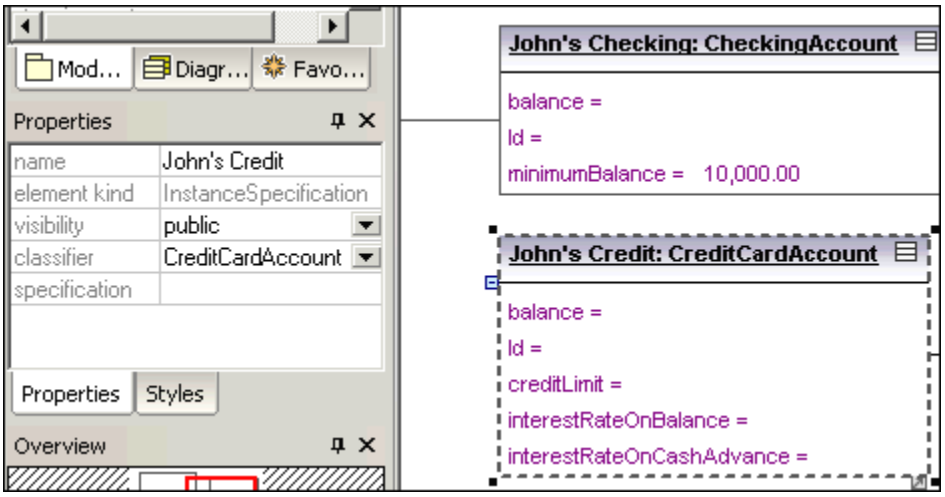
To add a new object/instance by selecting its type:

1. Click the **InstanceSpecification** icon  in the icon bar, then click under the John's Checking object in the diagram tab.
2. Change the name of the instance to **John's Credit**, and press Enter.



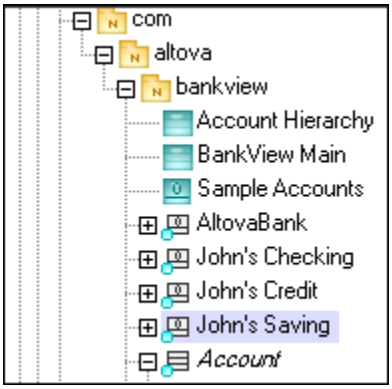
While the instance is active, all its properties are visible in the Properties tab.

3. Click the **classifier** combo box and select the entry **CreditCardAccount** from the dropdown list.



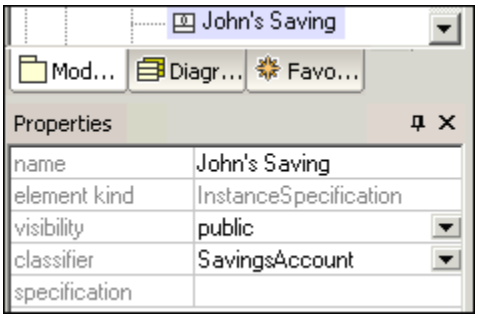
To add a new object in the Model Tree view (then insert it into a diagram):

1. Right click the **bankview** package in the **Model Tree tab**, and select **New | InstanceSpecification**.
2. Change the default object name to **John's Saving**, and press Enter to confirm. The new object is added to the package and sorted accordingly.

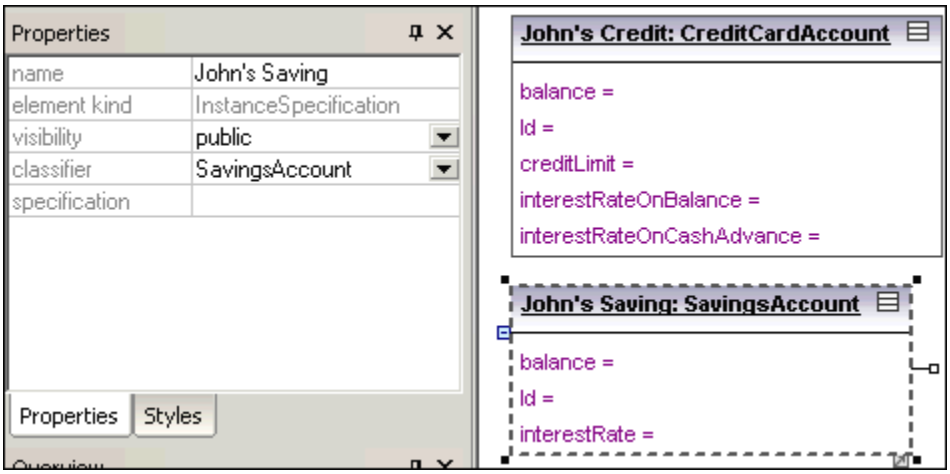


While the object is still selected in the Model Tree tab,

3. Click the **classifier** combo box, in the **Properties** tab, and select **SavingsAccount**.



4. Drag the John's Saving object/instance from the Model Tree tab, into the Sample Accounts tab, placing it below John's credit.

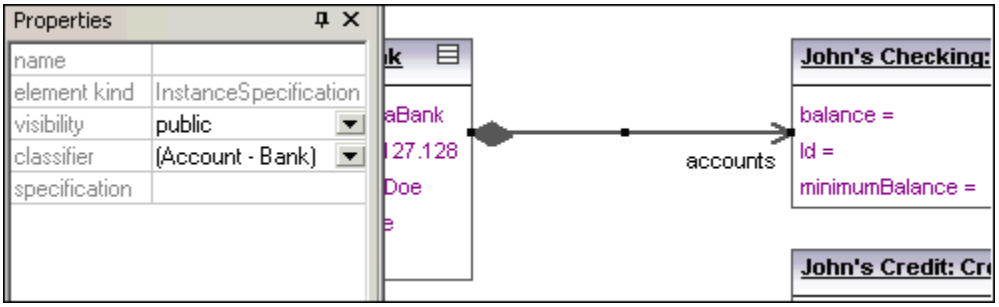


Creating "links" between objects:

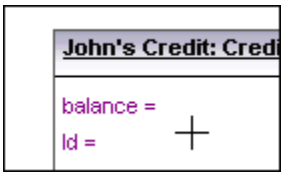
Links are the instances of class associations, and describe the relationships between objects/instances at a fixed moment in time.

1. Click the existing link (association) between the **AltovaBank** and John's Checking.
2. In the Properties tab, click the **classifier** combo box and select the entry **Account** -

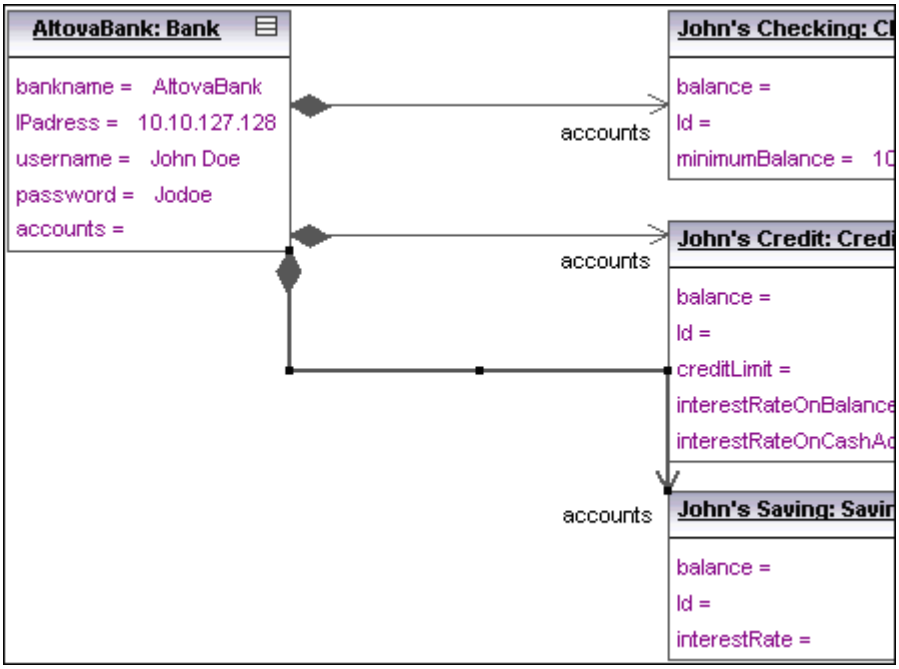
Bank.
The link now changes to a composite association, in accordance with the class definitions.



3. Click the **InstanceSpecification** icon  in the icon bar, and position the cursor over the John's Credit class.
The cursor now appears as a + sign.



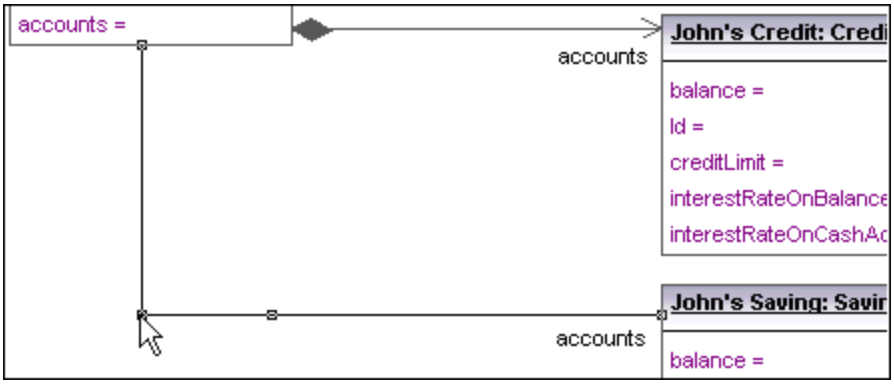
4. Drag from **John's Credit** object to AltovaBank to create a link between the two.
5. Use the **classifier** combo box in the Properties tab to change the link type to **Account - Bank**.
6. Use the method outlined above to create a link between **John's Saving** and AltovaBank.



Please note:
Changes made to the association type in any class diagram, are now automatically updated in the object diagram.

Formatting association/link lines in a diagram:

1. Click the lowest link in the diagram, if not active, and drag the corner connector to the left.
   This allows you to reposition the line both horizontally and vertically.

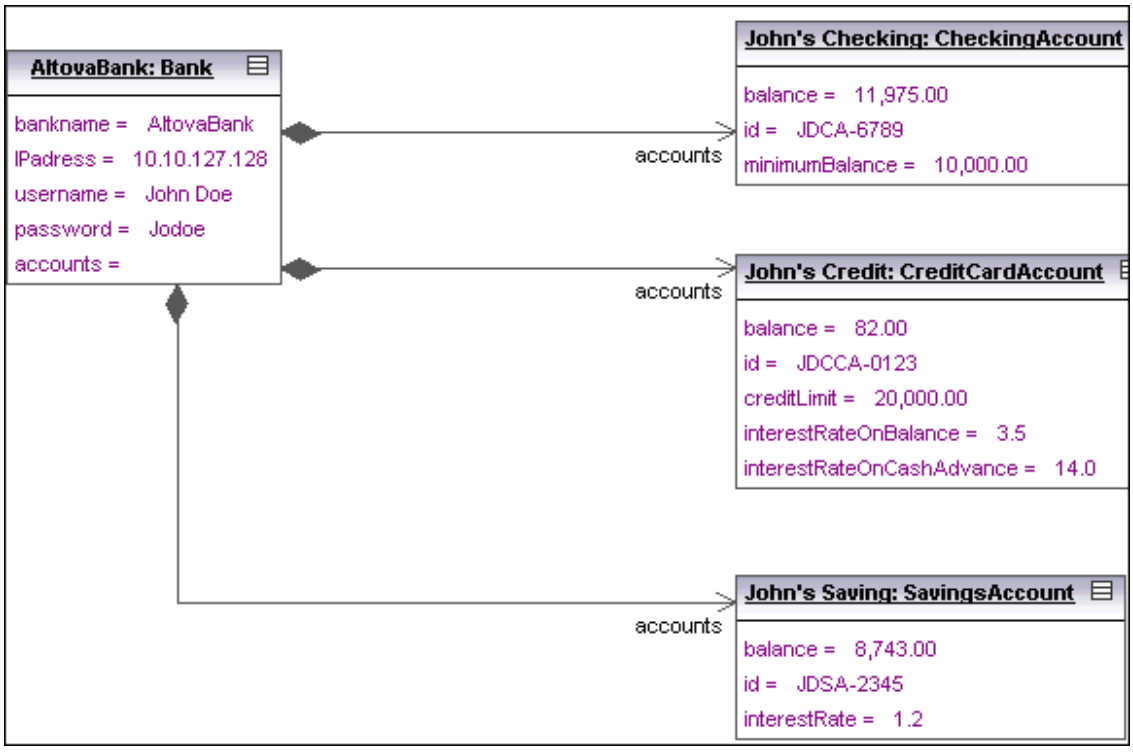


   Use this method to reposition links in the diagram tab.

Entering sample data into objects:

The instance value of an Attribute/Property in an object is called a **slot**.

1. Click in the respective slots of each object and enter sample data.
2. E.g. in **John's Checking** object, double click in the **balance** slot and enter 11,975.00 as the balance.
3. Fill in the rest of the data to give yourself an idea of the current instance state.



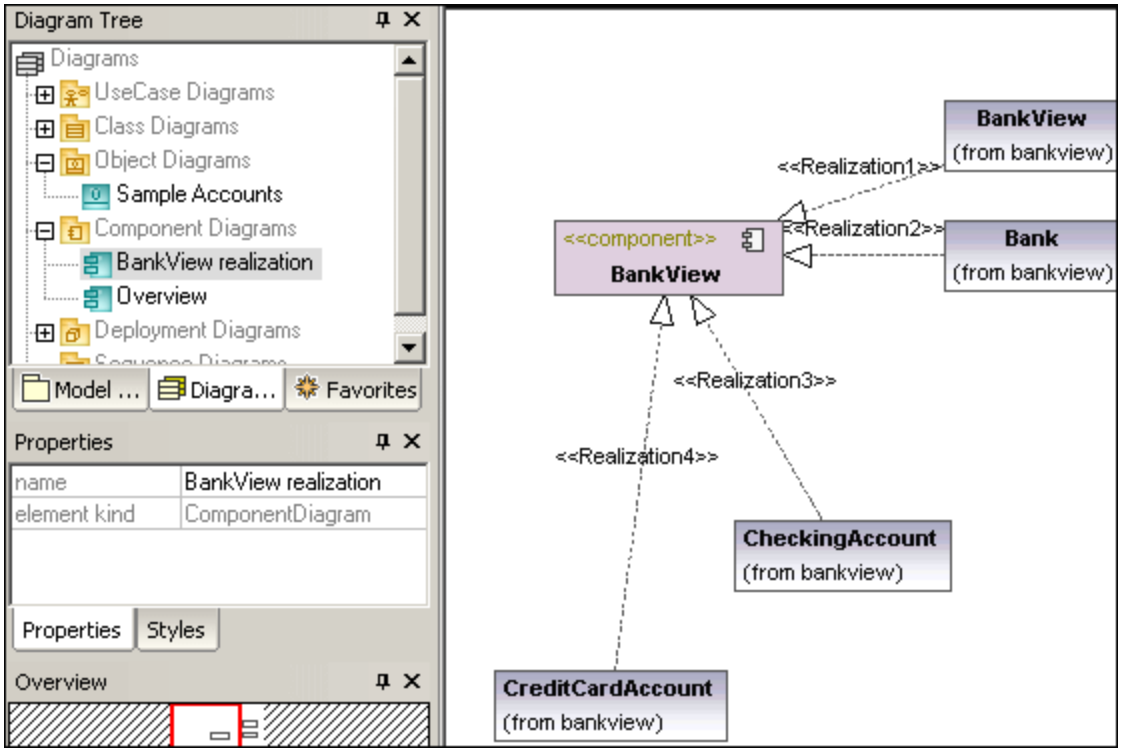
3.5 Component Diagrams

The aim of this tutorial section is to:

- Show how to insert classes into a component diagram
- Create realization dependencies between the classes and the BankView component
- Show how to change line properties
- Insert components into a component diagram, and create usage dependencies to an interface

To open the component diagram:

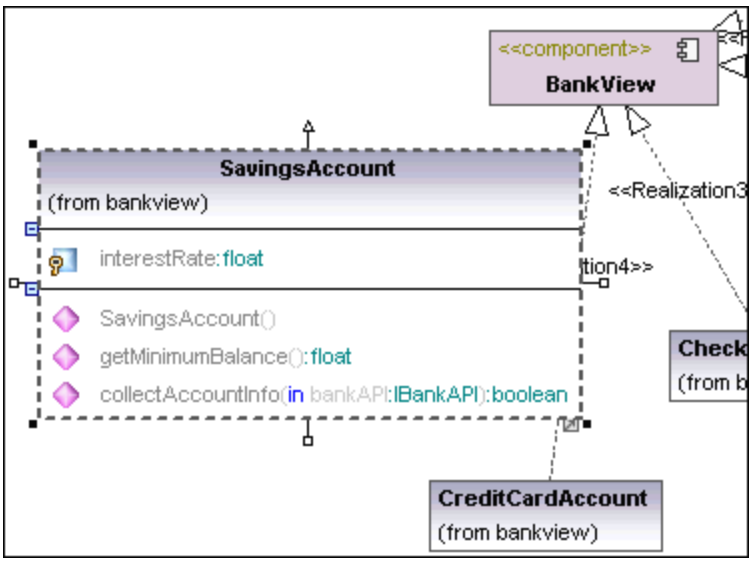
1. Click the Diagram Tree tab, expand the **Component Diagrams** component and double click the "BankView realization" diagram icon.
   The "BankView realization" component diagram is displayed.



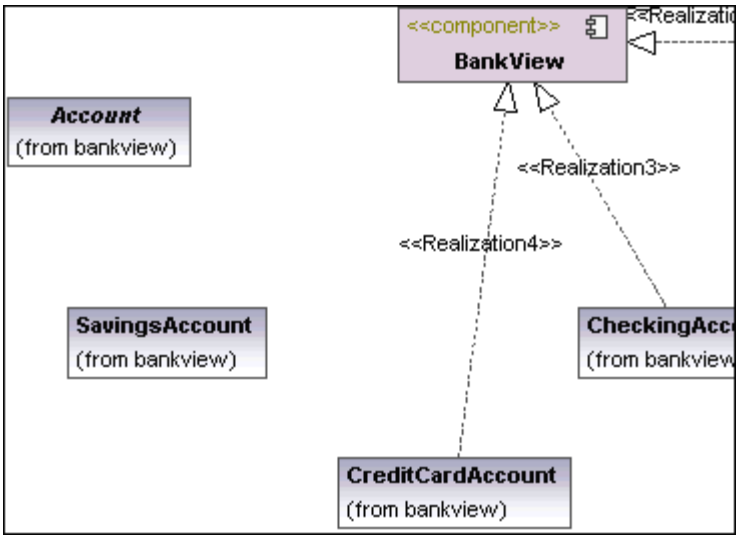
2. Switch back to the Model Tree tab by clicking that tab.

To insert (existing) classes into a component diagram:

1. Locate the **SavingsAccount** class  under the bankview package.
2. Drag it into the component diagram.
   The class is displayed with all its compartments.



3. Click both collapse icons to end up with the only the class name compartment.
4. Use the same method to insert the abstract class **Account**.

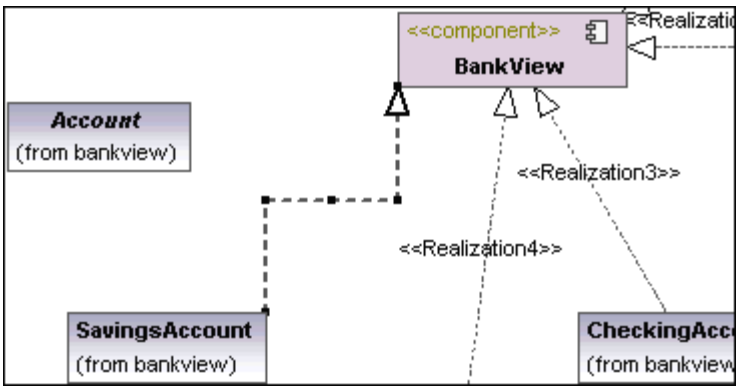


Please note:

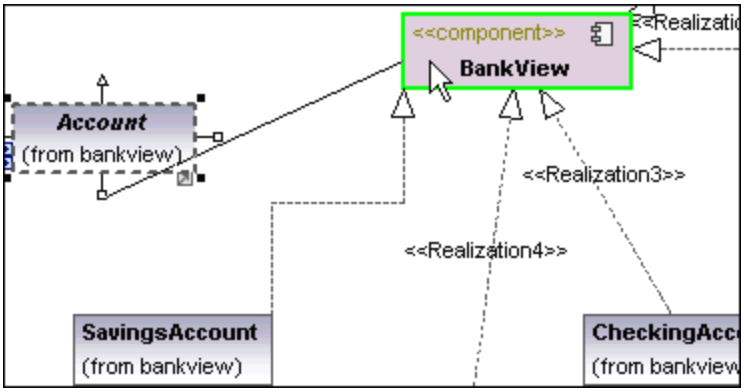
The package containing the inserted class, is displayed in the name compartment in the form "from bankview".

To create Realization dependencies between a class and component:

1. Click the Realization icon  in the icon bar.
2. Drag from **SavingsAccount**, and drop the arrow on the **BankView** component.



3. Click the **ComponentRealization** handle of the Account class (at the base), and drop it on the BankView component.

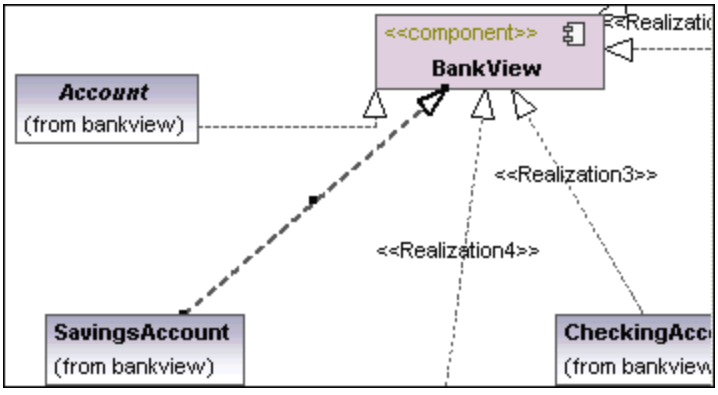


Both of these methods can be used to create realization dependencies. There is another method that allows you to create realization dependencies solely in the Model Tree, please see Round-trip engineering (code - model - code) for more information.

Changing (Realization) line characteristics:

Clicking a dependency or any other type of line in a UModel diagram, activates the line drawing icons in the Layout icon bar.

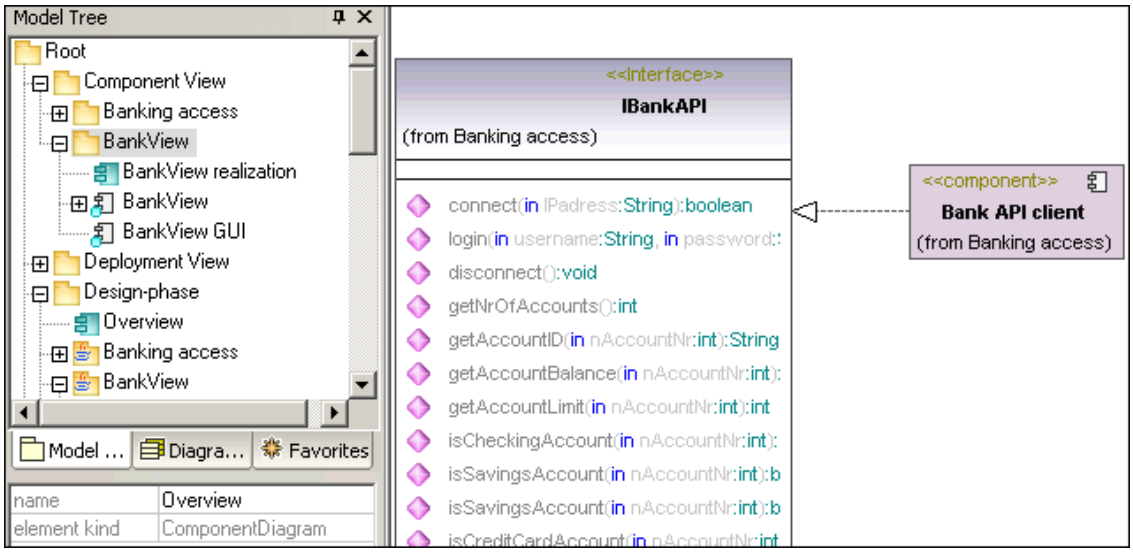
1. Click the realization line between **SavingsAccount** and BankView.
2. Click the line type icon **Direct line**  in the Layout toolbar.



The line properties are immediately altered. Lines have small icons along them called **waypoints**. Waypoints can be clicked and moved to alter line characteristics. Change the line properties to suit your needs.

Inserting components and creating usage dependencies:

1. Double click the **Overview** diagram icon directly under the **Design-phase** package in the Model Tree.
   The Overview component diagram is opened and displays the currently defined system dependencies between components and interfaces.

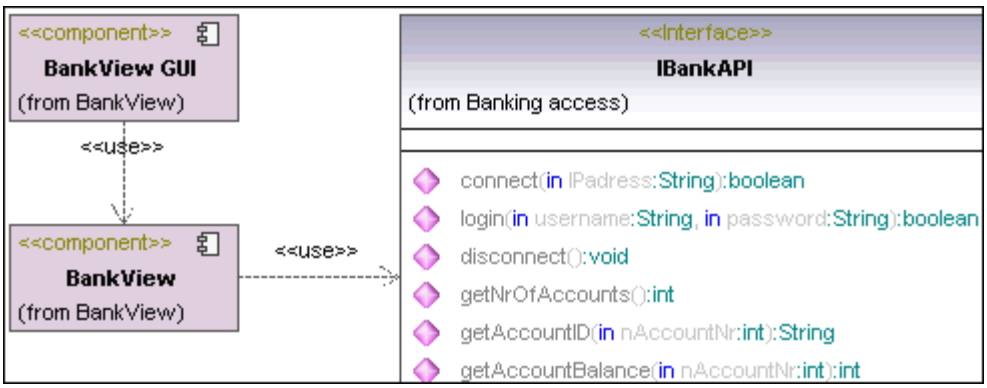


2. Click the **BankView GUI** component under the **Component View | BankView** package in the Model Tree, and drag it into the **Overview** diagram tab.
   The package containing the inserted component is displayed in the name compartment, "from BankView".
3. Use the same method to insert the **BankView** component under the same package.

The BankView component is the component produced by the "forward-engineering" process described in this tutorial.

To create a usage dependency between interfaces and components:

1. Click the Usage icon  in the icon bar.
2. Drag from the **BankView GUI** component to the **BankView** component.
3. Click the Usage icon again, and drag from the **BankView** component to the **IBankAPI** interface.



The usage dependency (<<use>>) connects a **client** element to a **supplier** element. In this case the IBankInterfaceAPI interface uses the services of components BankView and BankView GUI.

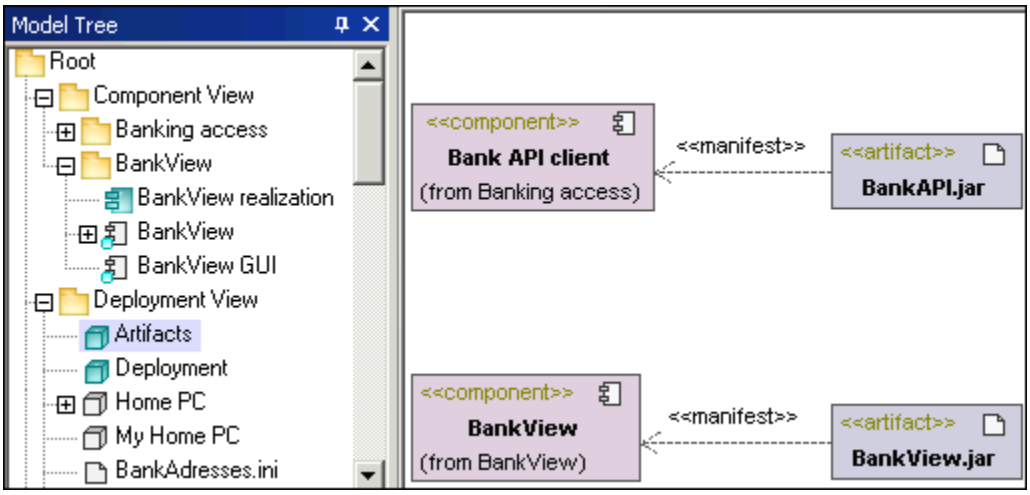
3.6 Deployment Diagrams

The aim of this tutorial section is to:

- Show the artifact manifestation of components
- Add a new node and dependency to a Deployment diagram
- Add artifacts to a node and create relationships between them

To open the Deployment (Artifacts) diagram:

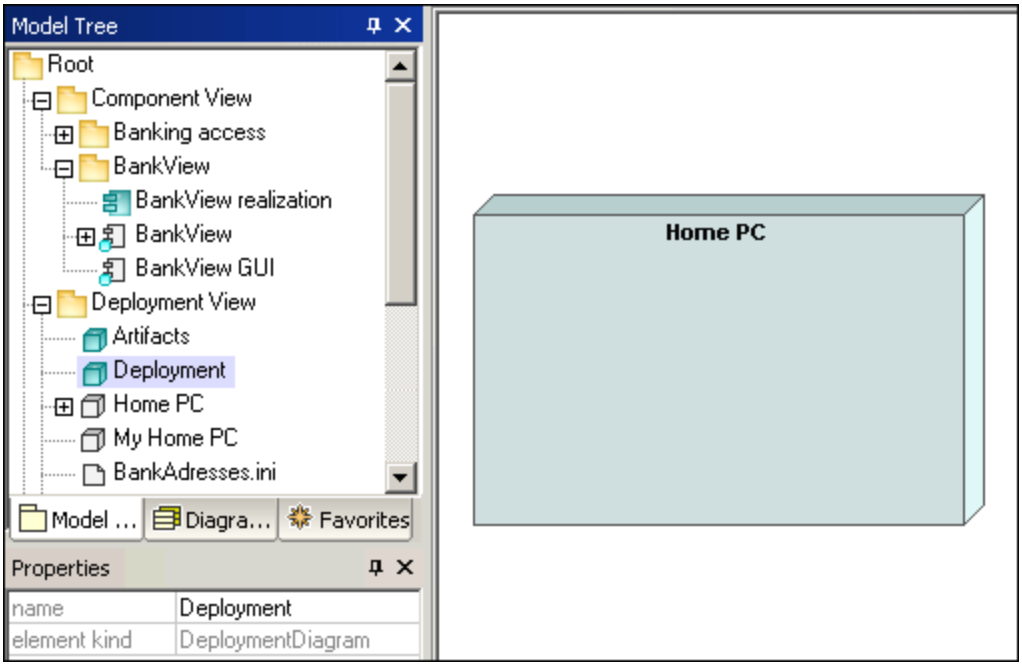
1. Click the Model Tree tab, expand the **Deployment View** diagram package, then double click the **Artifacts** icon.



This diagram shows the manifestation of the **Bank API client** and the **BankView** components, to their respective compiled Java **.jar** files.

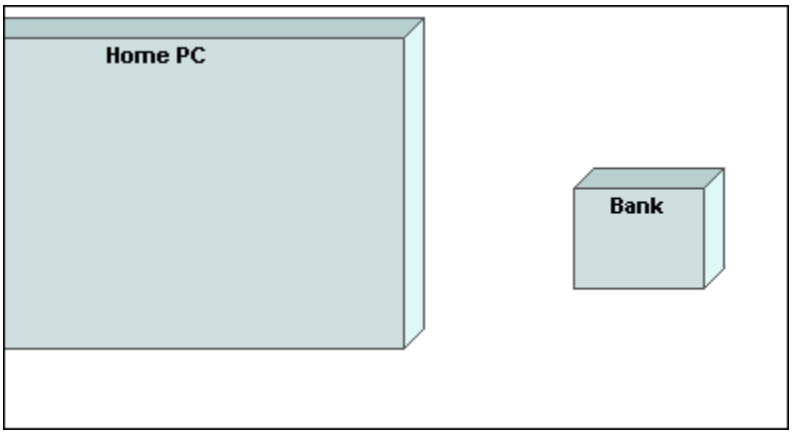
To open the Deployment diagram:

1. Double click the **Deployment** icon under the Deployment View package.
   The Deployment diagram is opened and displays the physical architecture of the system, which currently only comprises of the Home PC node.



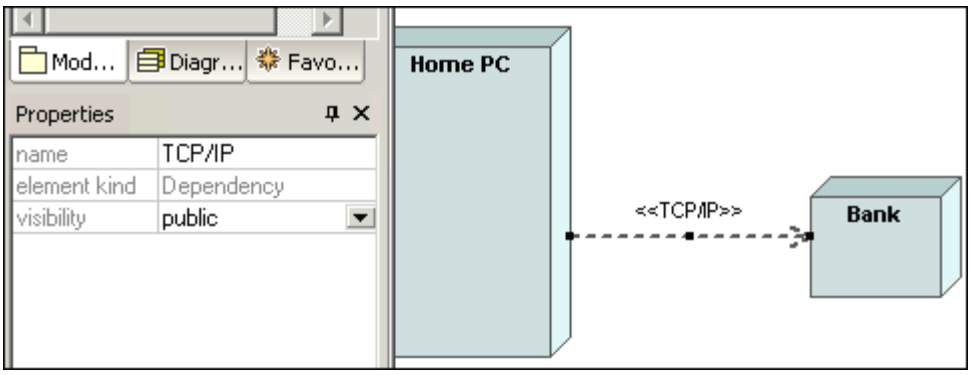
To add a Node to a Deployment diagram:

1. Click the Node icon  in the icon bar, and click right of the Home PC node to insert it.
2. Rename the node to Bank, and drag on one of its edges to enlarge it.



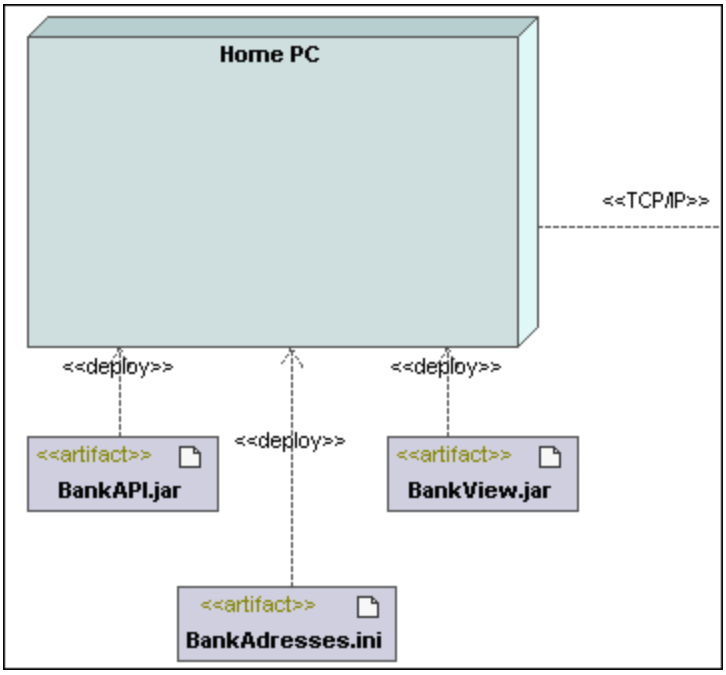
To create a dependency between two nodes:

1. Click the dependency icon  , then drag from the **Home PC** node to the **Bank** node. This creates a dependency between the two nodes.
2. Click into the **name** field of the Properties tab, change it to **TCP/IP**, and press Enter to confirm.
   The dependency name appears above the dependency line.

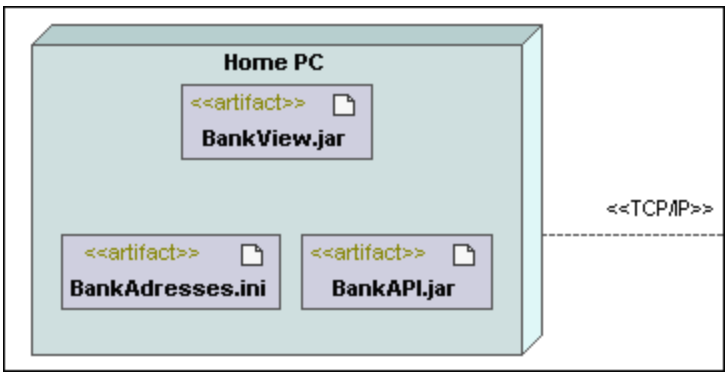


Adding artifacts to a node and creating dependencies between them:
Expand the Deployment View package, in the Model Tree, to see its contents:

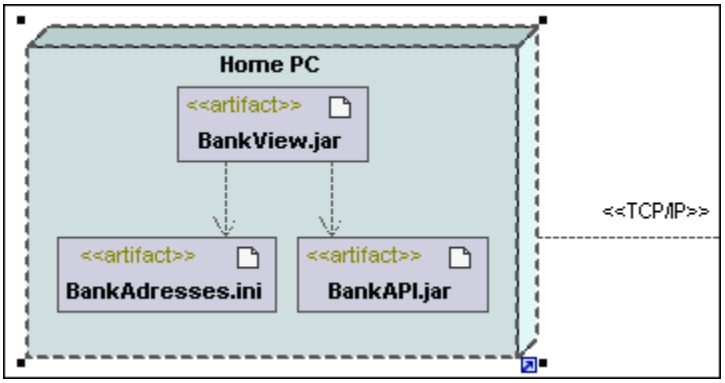
1. Click each of the **BankAddresses.ini**, **BankAPI.jar** and **BankView.jar** artifacts individually, and place them on the diagram background (Deployment dependencies are displayed for each artifact).



2. Click the **BankView.jar** artifact and drag it onto the **Home PC** node.
   The node is highlighted when the drop action will be successful.
3. Use the same method to drag the other artifacts onto the Home PC node.
   The artifacts are now part of the node and move with it when it is repositioned.



4. Click the Dependency icon  in the icon bar, and hold down the **CTRL** key.
5. Drag from the **BankView.jar** artifact to the **BankAddresses.ini** artifact; still holding down the CTRL key.
6. Drag from the **BankView.jar** artifact to the **BankAPI.jar** artifact.



Please note:
Dragging an artifact out of a node onto the diagram background, automatically creates a Deployment dependency.

To delete an artifact from a node and the project:

- Click the artifact you want to delete and press the **Del** keyboard key.

  The artifact and any dependencies are deleted from the **node** as well as the **project**.

To remove an artifact from a node and its diagram:

1. Use drag and drop to place the artifact onto the diagram background.
2. Hold down the **CTRL** key and press **Del**.

   The artifact and any dependencies are deleted from the current **diagram** and not from the project.

3.7 Round-trip engineering (model - code - model)

The aim of this tutorial section is to:

- Perform a project syntax check
- Generate project code
- Add a new method external code i.e. to the SavingsAccount class
- Synchronize the UModel model new code with the model

Packages and Code / model synchronization:
Code can be merged/synchronized at different levels:

- Project, Root package level (menu item)
- Package level (multiple package selection / generation is possible)
- Class level (multiple class selection / generation is possible)

The BankView realization diagram, depicts how the BankView component is realized by its six constituent classes. This is the component that is produced when the forward-engineering section of the tutorial is complete.

To be able to produce code:

- The component must be **realized** by one or more classes.
- The component must have a **physical location**, i.e. directory, assigned to it. The generated code is then placed in this directory.
- Components must be individually set to be **included** in the code engineering process.
- The Java, and C#, namespace root package must be defined.

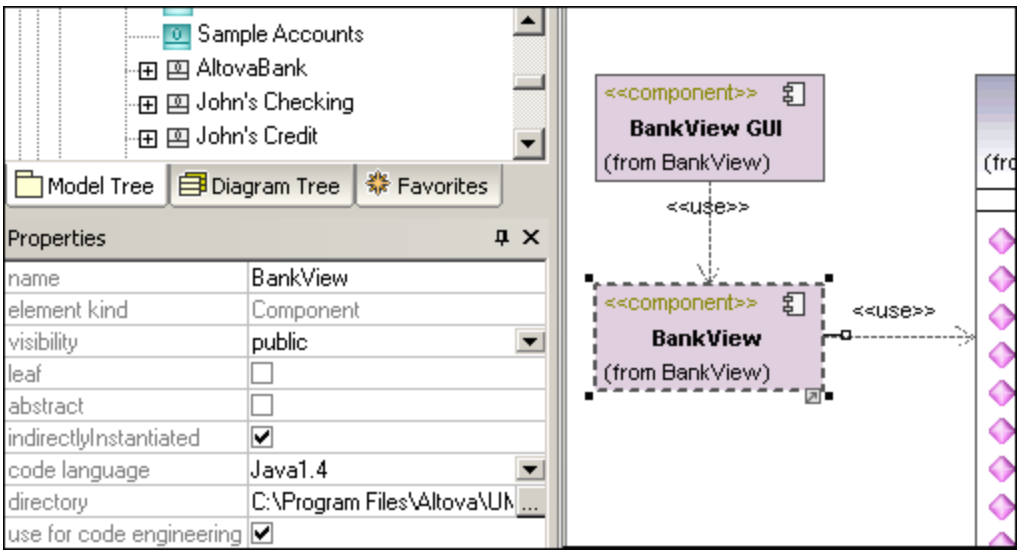
Please note:

The Java namespace root has been set on the **Design-phase | BankView | com** package in the Model Tree.

Java and C# code can be combined in one project and are automatically handled during the round-trip engineering process. The Bank_MultiLanguage.ump file in the UModelExamples folder is an example of a project for both types of code.

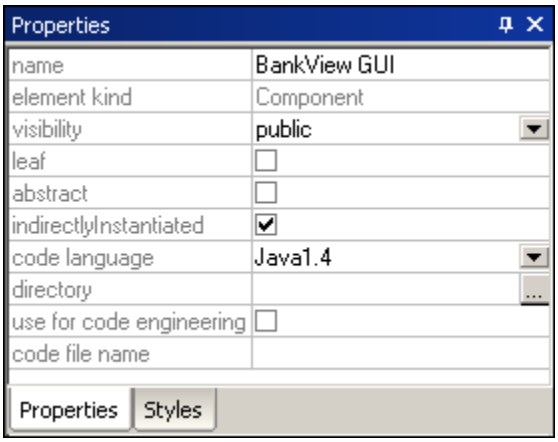
To define a code generation target directory:

1. Double click the  **Overview** icon under the **Design-phase** package to switch into the component overview.
2. Click the **BankView** component, in the diagram, and note the current settings in the Properties tab.
3. Click the browse button  , to the right of the directory field.
4. Enter/select the target directory in the dialog box (**C:\Program Files\Altova\UModel2006\BankView-code\com\altova\bankview**), or use the "Make New Folder" button to create a new folder. If you create a new folder, make sure the path ends in **...\newfolder\com\altova\bankview**.
   The path now appears in the directory field.



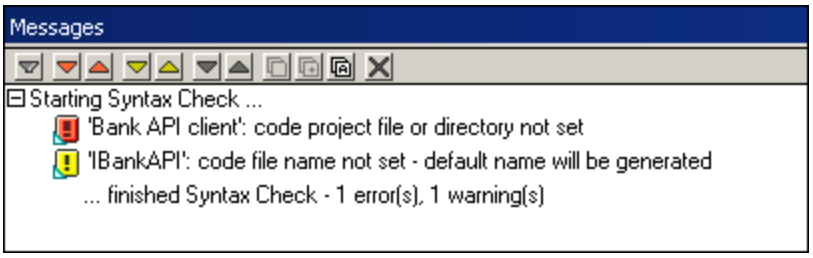
To include/exclude components from code generation:

1. Click the **BankView GUI** component.
2. **Uncheck** the "use for code engineering" check box (if not already unchecked).

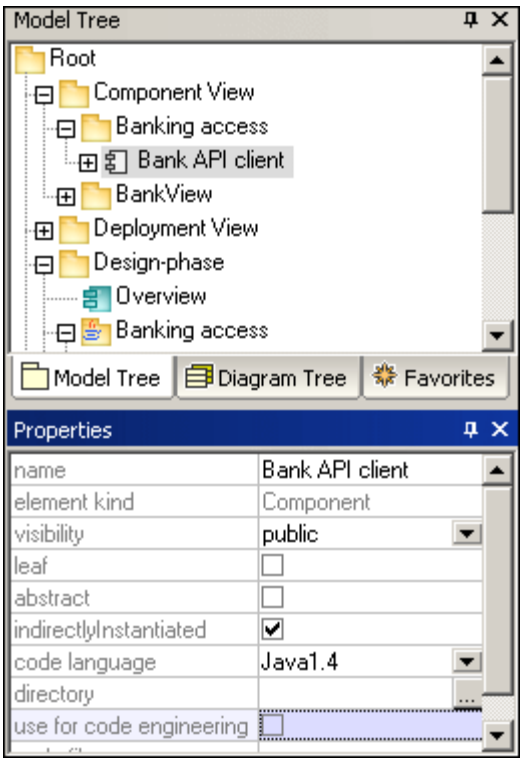


Checking project syntax prior to code generation:

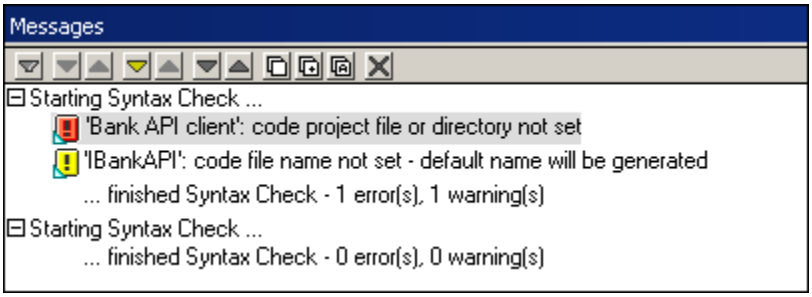
1. Select the menu option **Project | Check project syntax**.
2. A syntax check is performed, and messages appear in the Messages window, "Bank API-client: **code project file or directory not set**" - "IBankAPI: code file name not set".



3. Click the first message in the messages window.
4. The Bank API client package is highlighted in the Model Tree view, with its properties visible in the Properties tab.
5. **Uncheck** the "use for code engineering" check box for the Bank API client component.



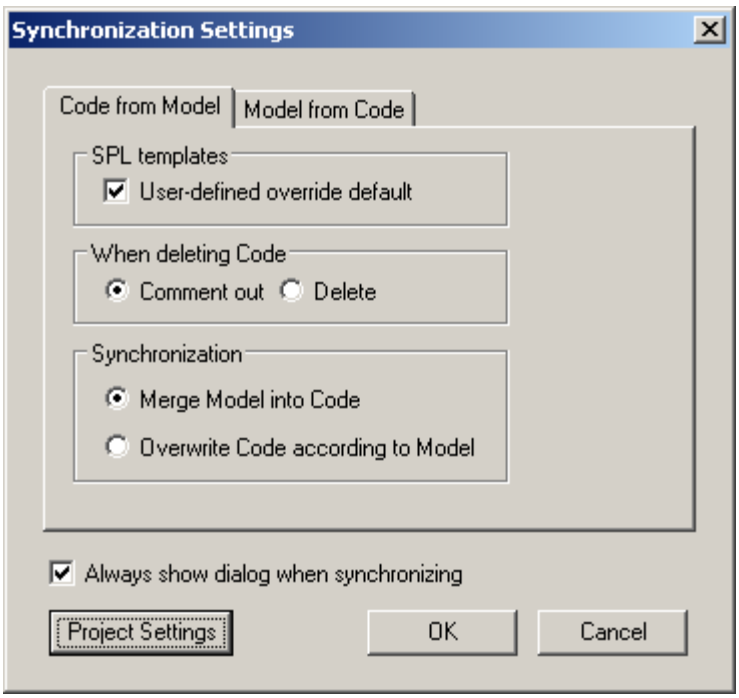
6. Check the project syntax again using **Project | Check project syntax**.



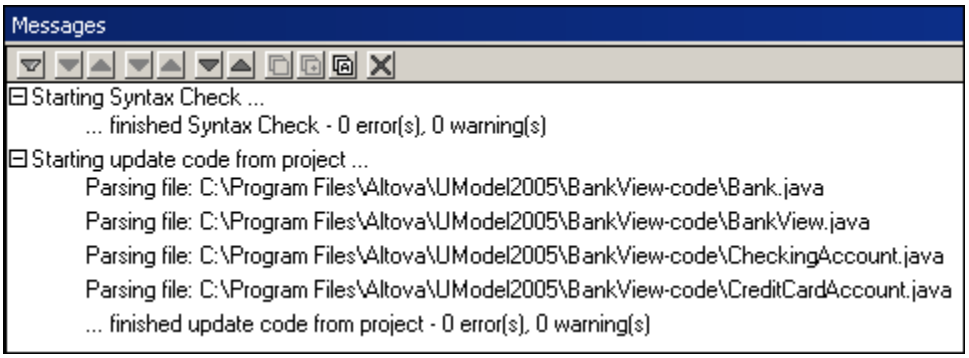
No errors are reported this time around. We can now generate program code for this project. Please see Check Project syntax for more information.

To generate project code:

1. Click the **BankView** package to select it.
2. Select the menu option **Project | Merge Program Code from UModel project**.
3. Select your synchronization options from the dialog box, and press OK to proceed (no changes needed for the tutorial; see "Merge Program Code from UModel project" for more information).



The message pane displays the outcome of the code generation process.



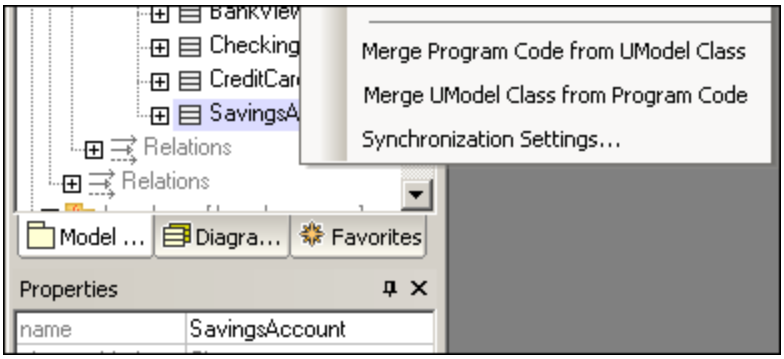
4. Navigate to the target directory.
   Six **.Java** files have been created for the project.

Synchronizing the UModel model having updated Java code externally:

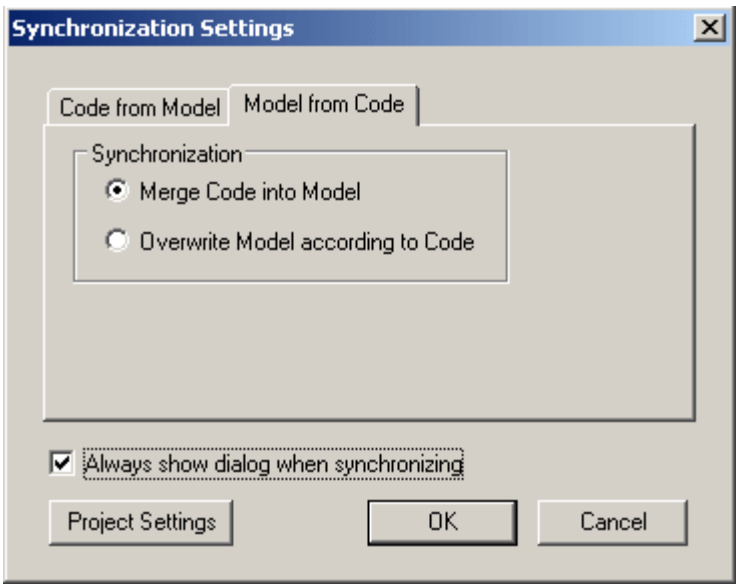
1. Open the **SavingsAccount.java** file in the text editor of your choice, XMLSpy for example.
2. Add the new **method** to the generated code "**public float getInterestRate() {}**", and save the file.

```
1
2     public class SavingsAccount extends Account
3     {
4
5         protected float interestRate;
6
7         public SavingsAccount()
8         {
9         }
10
11        public float getMinimumBalance()
12        {
13        }
14
15        public float getInterestRate()
16        {
17        }
18
19        public boolean collectAccountInfo(IBankAPI bankAPI)
20        {
21        }
22    }
23
```

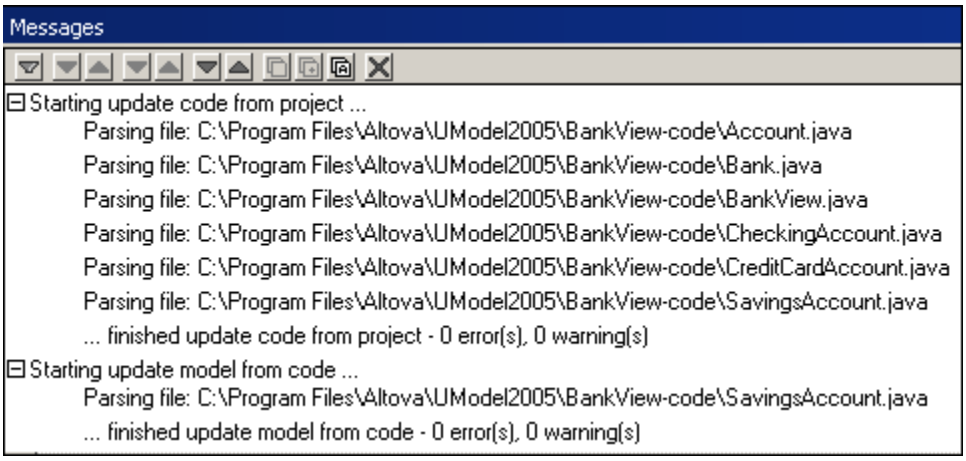
3. Switch to UModel and right click the **SavingsAccount** class  under the BankView package.
4. Select the option **Merge UModel Class from Program Code**.



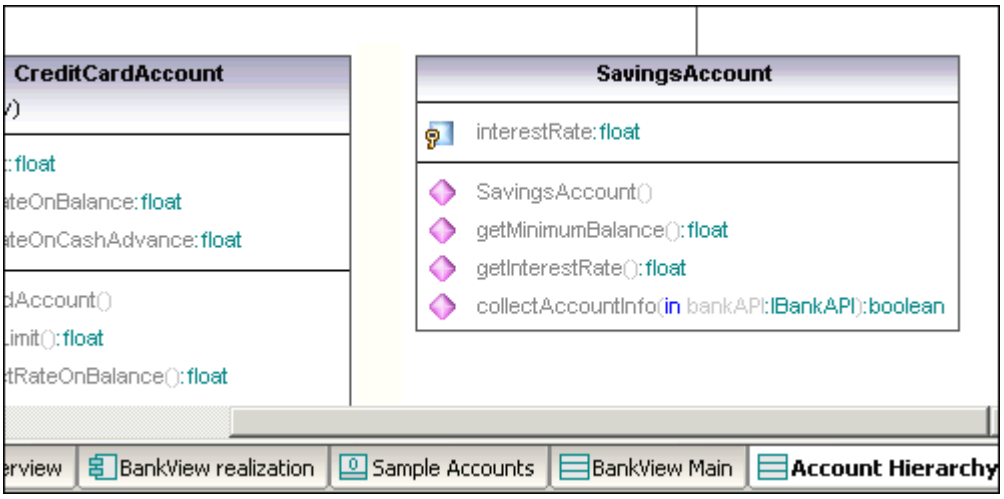
This opens the Synchronization Settings dialog box with the "Model from Code" tab being active. No changes are needed for the tutorial; see "Merge UModel project from code" for more information)



5. Click OK to merge the model from the code.



6. Click the **Account Hierarchy** tab to see the outcome of the merge process.



The new method added to the code, (getInterestRate...) generates a new **operation** in

the SavingsAccount **class** of UModel.

3.8 Round-trip engineering (code - model - code)

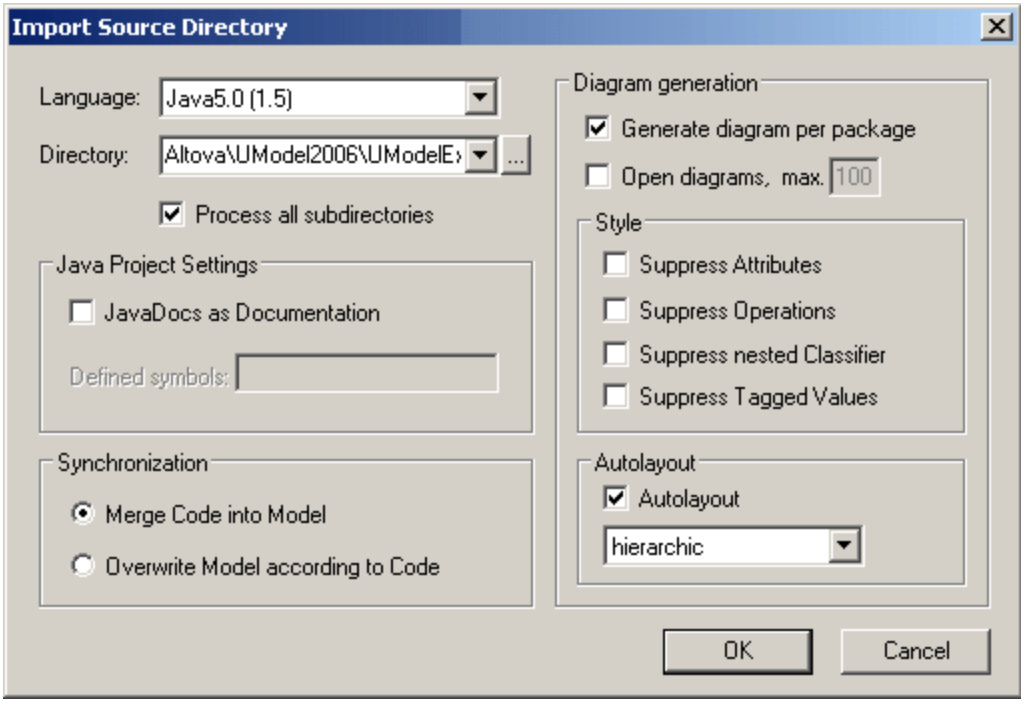
The aim of this tutorial section is to:

- Import a directory containing Java code generated by XMLSpy
- Add a new class to the project in UModel
- Merge to the program code from a UModel package

The files used in this example are available as the **OrgChart.zip** file under **...\UModelExamples** folder of your installation. Please unzip the OrgChart.zip file into the ...\UModelExamples folder before you start this section.
This creates the **OrgChart** directory which will then be used to import the existing code.

To Reverse engineer/import existing code from a directory:

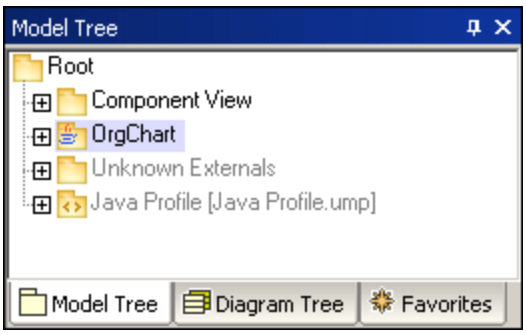
1. Select **File | New** to create a new project.
2. Select **Project | Import source directory**.
3. Select the C#, or Java version (1.4, or 5.0.) that the source code conforms to.
4. Click the Browse button ... and select the **OrgChart** directory supplied in the **...\UModelExamples** folder.



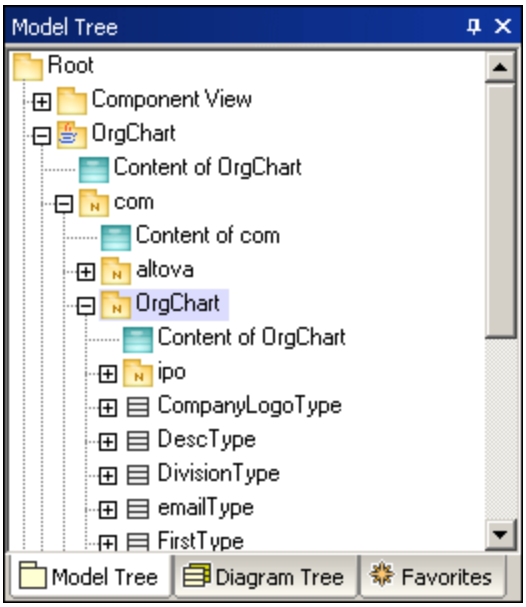
5. Making sure that the "**Generate diagram per package"** check box is active, select any specific import settings you need, and press OK.

   Please note: If your project contains packages other than Component View, a dialog box will appear at this point allowing you to select the target package.

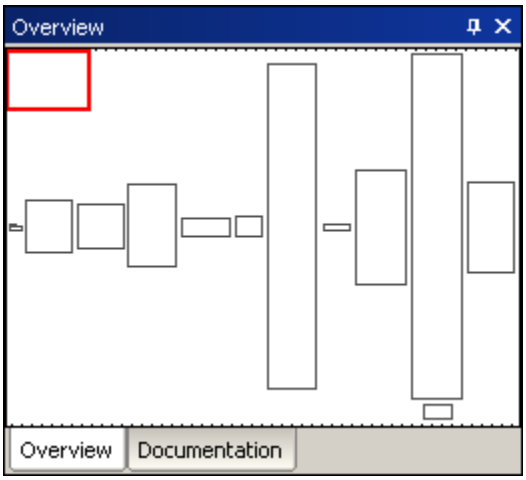
   The data is parsed while being input, and a new package called "**OrgChart**" is created.



6. Expand the new package and keep expanding the sub packages until you get to the **OrgChart** package (com | OrgChart).

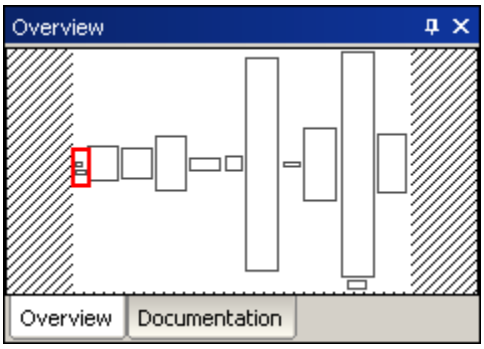


7. Double click the "**Content of OrgChart"** diagram icon .
The tab seems to be empty at this point. The diagram is so large that it cannot be fully viewed in the tab. The current window/view is shown by the red box in the Overview window, which occupies an empty area of the diagram.

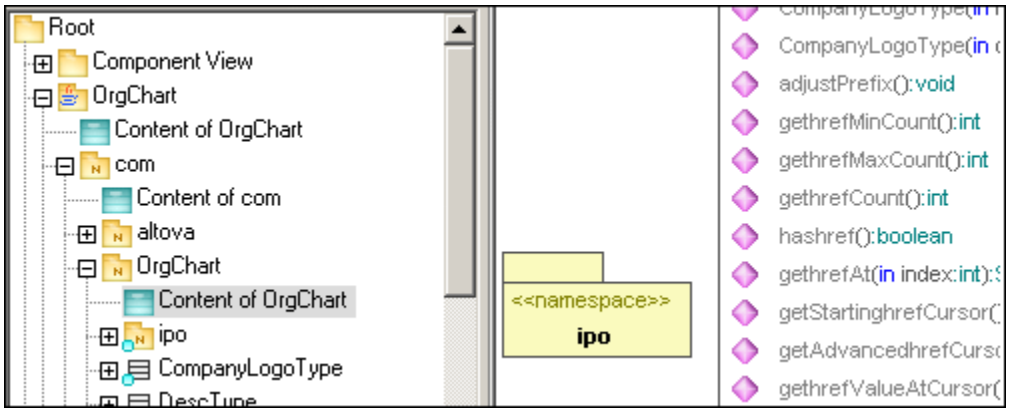


8. Click the red box in the Overview pane, and drag it down, to view specific sections of

the diagram.



You can now see the constituent classes of the imported code.



Please note:

You could also select the **Project | Import source project** option and select the Borland JBuilder **OrgChart.jpx** project file to import the project created by XMLSpy.

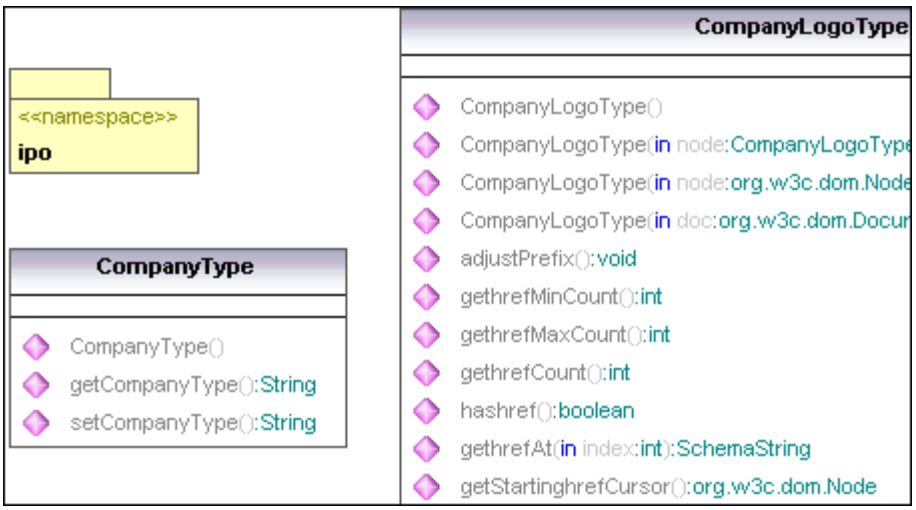
Round-trip engineering and relationships between modeling elements:

When updating model from code, associations between modeling elements are automatically displayed, if the option **Editing | Automatically create Associations** has been activated in the **Tools | Options** dialog box. Associations are displayed for those elements where the attributes type is set, and the referenced "type" modeling element is in the same diagram.

InterfaceRealizations as well as Generalizations are all automatically shown in the diagram when updating model from code.

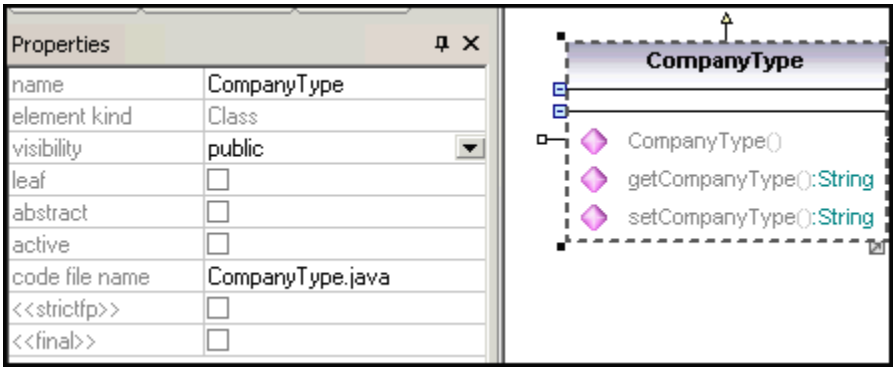
Adding a new class to the OrgChart diagram:

1. Click the Class icon  in the icon bar and click to insert a new class.
2. Add a new Class called **CompanyType**.
3. Add new operations to the class using the F8 shortcut key:
   e.g. **CompanyType()**, **getCompanyType():String**, **setCompanyType():String.**

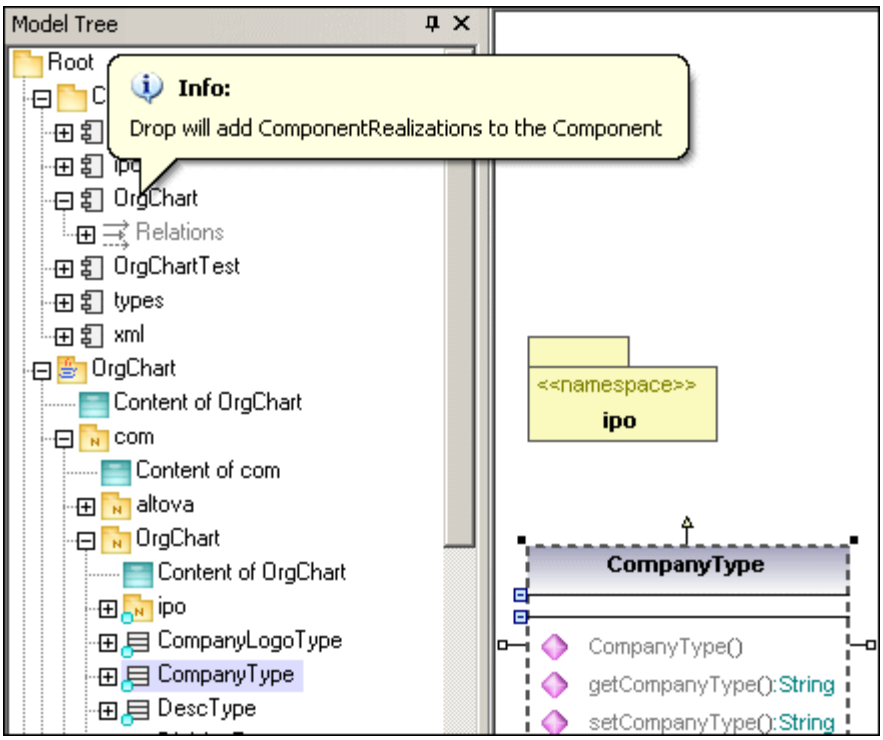


Making the new class available for code generation:
While the CompanyType class is active,

1. Click into the "code file name" field and enter the Java file name of the new class **CompanyType.java**.



2. Click the new CompanyType **class** in the Model Tree, drag upwards and drop onto the **OrgChart** component below the Component View package. A popup appears when the mouse pointer is over a component.



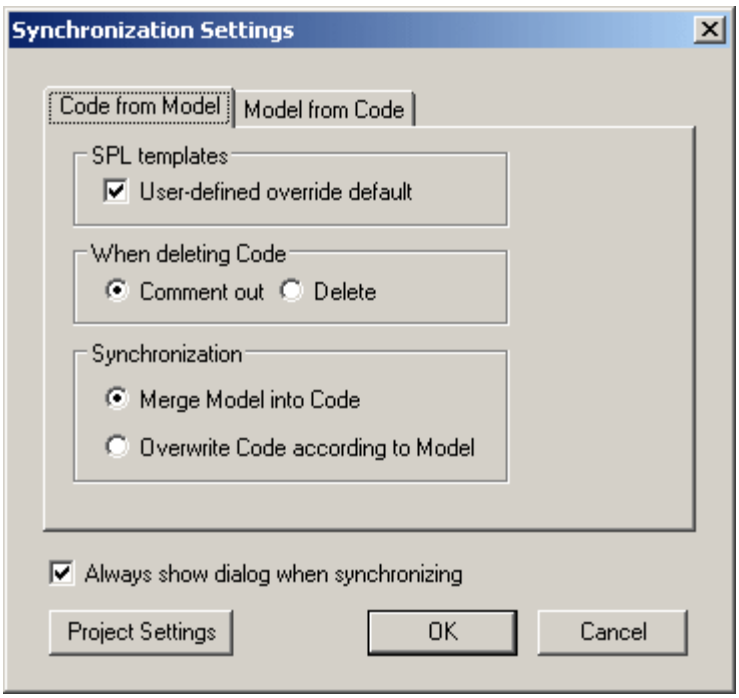
Please note:

This method creates a Realization between a class and a component, without having to use component or deployment diagrams.

3. Expand the **Relations** item below the Orgchart component, to see the newly created realization.

Merging program code from a package:

1. Right click the **OrgChart** package, select **Merge Program code from UModel package**, and press Enter to confirm.



The messages window displays the syntax checks being performed and status of the synchronization process.

When complete, the new **CompanyType.java** class has been added to the folder **...\OrgChart\com\OrgChart\.**

Please note:

All method bodies and changes to the code will either be commented out or deleted, depending on the setting in the "When deleting code" group, in the Synchronization settings dialog box.

That's it!

You have learned how to create a modeling project using the forward engineering process, and also completed a full round-trip code engineering cycle with UModel. The rest of this document describes how best to achieve modeling results with UModel.

Chapter 4

UModel User Interface

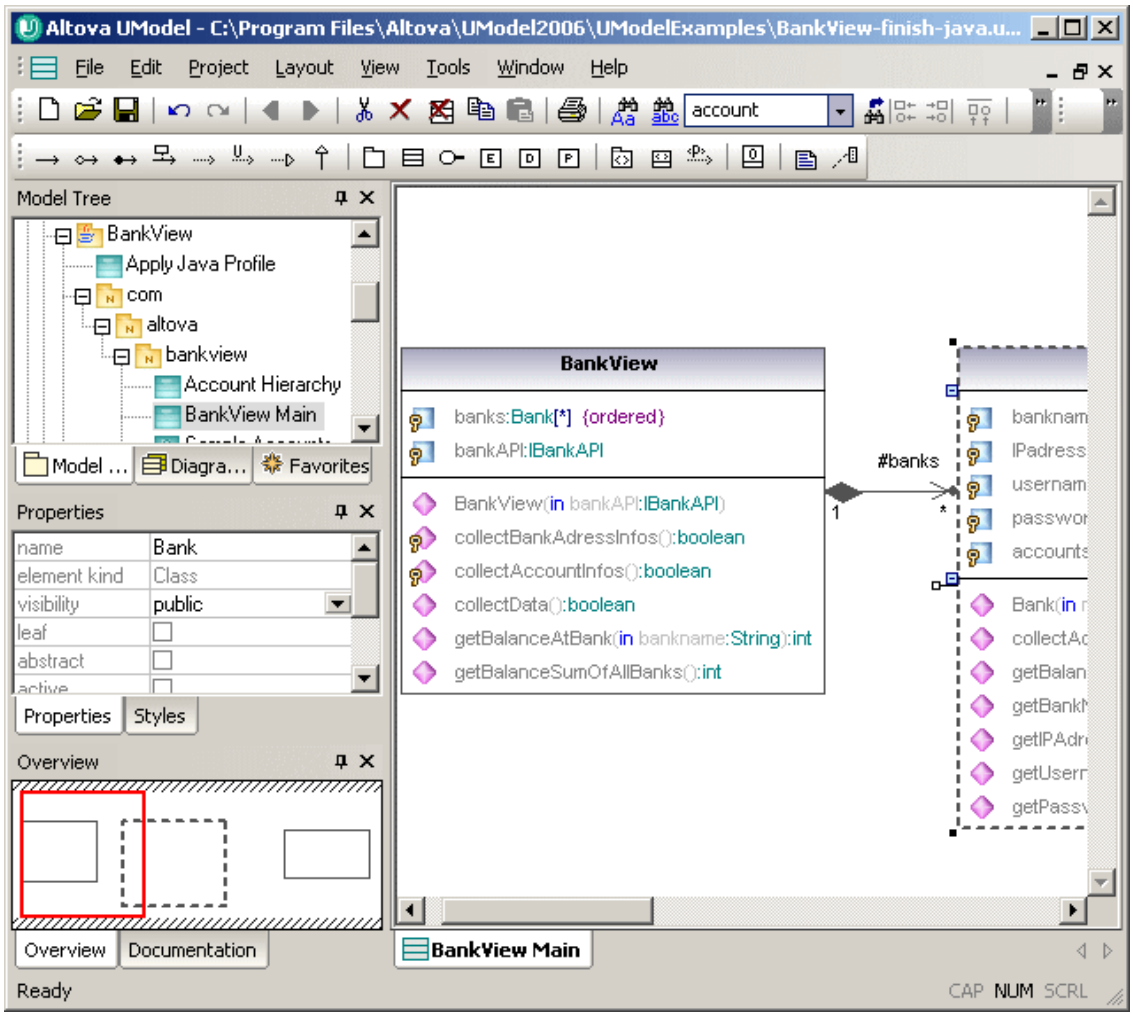
4 UModel User Interface

UModel consists of series of panes on the left and a larger diagram tab at right. The panes at left allow you to view and navigate your UModel project from differing viewpoints, and edit data directly.

The panes are Model Tree, Properties, and Overview. The working/viewing area at right is the UModel Diagram tab which currently shows the Class Diagram of the BankView Main package.

Please note:

All panes, as well as diagram tabs, can be searched using the **Find** combo box in the Main toolbar, which contains the text "**account**" in the screenshot below, or by pressing CTRL+F.

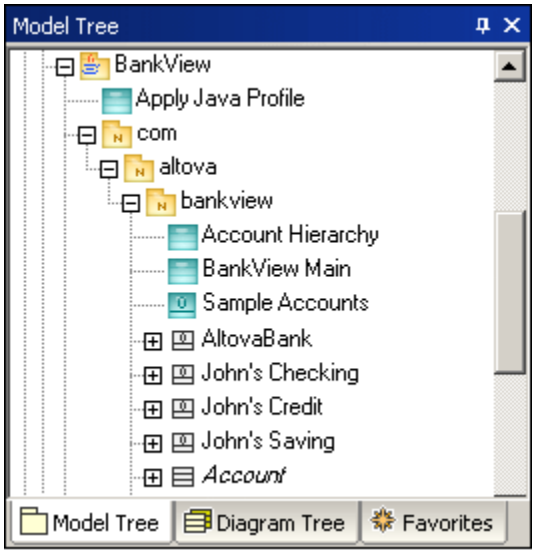


4.1 Model Tree pane

Model Tree tab
The Model Tree tab allows you to manipulate model items directly in the Model Tree, as well as navigate/view specific items in the Design tab. Right clicking an item opens the context menu, from which specific commands can be selected. The contents of the context menu depend on the item that you select.

Model elements in the Model Tree pane can be directly manipulated:

- Added / inserted
- Copied or moved
- Deleted
- Renamed
- Sorted according to several criteria
- Constrained



In the Model Tree tab, each folder symbol is a UML package!

Adding a new package (or any other modeling element):

1. Right click the **folder** that you want the new package/element to appear under.
2. Select **New | Package** (or respective model Element).

Copying or moving model elements:

1. Use the standard windows Cut, Copy or Paste commands or,
2. Drag model elements to different packages. Dragging an elements moves it. Holding down CTRL a and dragging an element creates a copy.

   When dragging elements a message might appear stating that select "No sort" needs to be activated to allow you to complete the action. Please see "Cut, copy and paste in UModel Diagrams" for more information.

Sorting elements in the Model Tree (activating no sort):

1. Right click the empty background of the Model Tree tab.
2. Select **Sort | No sort**.
   Elements can now be positioned anywhere in the Model Tree.

Please note:
The Sort popup menu also allows you to individually define the sort properties of

Properties and **Operations**.

Renaming an element:

1. Double click the element **name** and edit it.
   The Root and Component View packages are the only two elements that cannot be renamed.

Deleting an element:

1. Click the element you want to delete (use CTRL+click to mark multiple elements).
2. Press the **Del.** keyboard key.

   The modeling element is deleted from the Model Tree. This means that it is also deleted from the Diagram tab, if present there, as well as from the project. Elements can be deleted from a diagram without deleting them from the project, using CTRL+Del. Please see deleting elements.

To open a diagram in the Diagram tab:

1. Double click the diagram icon of the diagram you want to view in the diagram tab.

Package types:

UML Package
Java namespace root package
C# namespace root package
Java, C#, code package (package declarations are created when code is generated)

Diagram types:

Use case diagram
Class diagram
Object diagram (InstanceSpecification)
Component diagram
Deployment diagram
Sequence diagram

Element types:

An element that is currently visible in the active diagram is displayed with a blue dot at its base. In this case a class element.

Class Instance/Object
Class instance slot

Class
Property
Operation
Parameter

Actor (visible in active use case diagram)
Use Case
Component
Node
Artifact
Interface

Relations (/package)
Constraints

Opening / expanding packages in the Model Tree view:
There are two methods available to open packages in the tree view; one opens all packages and sub packages, the other opens the current package.

Click the package you want to open and:

- Press the ***** key to open the current package and all sub packages
- Press the **+** key to open the current package.

To **collapse** the packages, press the **-** keyboard key.
Note that you can use the standard keyboard keys, or the numeric keypad keys to achieve this.

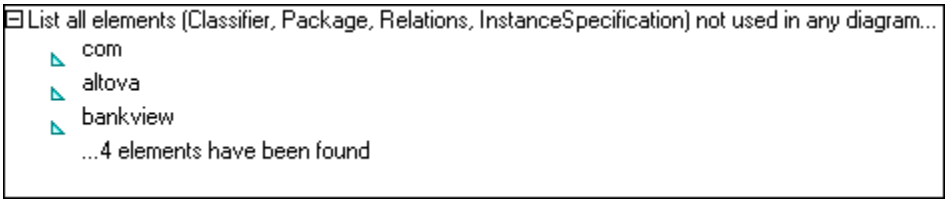
To find modeling elements in Diagram tab(s):

While navigating the elements in the Model Tree, you might want to see where, or if, the element is actually present in a model diagram. There are two methods to find elements:

1. Right click the element you want to see in the Model Tree tab, and select:
   - Show element in active diagram - to find it in the same type of diagram tab
   - Show element in all diagrams - if currently active diagram differs from selected model element.

To generate a list of elements not used in any diagram:

1. Right click the package you would like to inspect.
2. Select the menu option "List elements not used in any diagram.
   A list of unused element appears in the Messages pane. The list in parenthesis, displays the specific elements which have been selected to appear in the unused list, please see the **View** tab in Reference section under, **Tools | Options** for more information.



To **locate** the missing elements in the Model Tree:

- Click the element name in the Messages pane.

Please note:
The unused elements are displayed for the **current** package and its sub packages.

Packages in the Model Tree tab:

Only the Root and Component packages are visible on startup, i.e. when no project is currently loaded.

- Packages can be **created**, or deleted at any position in the Model Tree
- Packages are the containers for all other UML modeling elements, use case diagrams etc.
- Packages/contents can be **moved**/copied to other packages in the Model Tree (as well as into valid model diagrams in the diagram tab)
- Packages and their contents can be **sorted** according to several criteria
- Packages can be placed within other packages

- Packages can be used as the **source**, or **target** elements, when generating or synchronizing code

Generating/merging code:

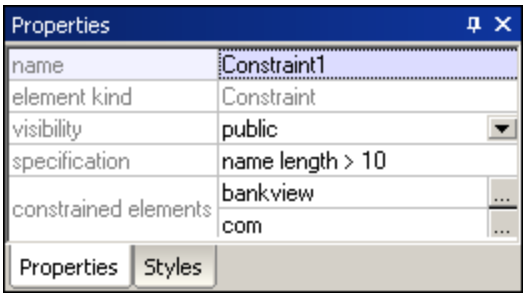
UModel allows you to generate, or merge program code directly from the Model Tree, please see: Synchronizing Model and source code for more information.

Constraining UML elements:

Constraints can be defined for most model elements in UModel. Please note that they are not checked by the syntax checker, as constraints are not part of the Java code generation process.

To constrain an element (Model Tree):

1. Right click the element you want to constrain, and select **New | Constraint**.
2. Enter the name of constraint and press Enter.
3. Click in the "specification" field of the Properties tab, and enter the constraint e.g. name length > 10.



To constrain an element in UML diagrams:

1. Double click the specific element to be able to edit it.
2. Add the constraint between curly braces e.g. interestRate:float #**{interestRate >=0}**.

To assign constraints to multiple modeling elements:

1. Right click the "constrained elements" field in the Properties tab.
2. Select "Add element to constrained elements".
   This opens the "Select Elements to be Constrained" dialog box.
3. Select the specific element you want to assign the current constraint to.

   The "constrained element" field contains the names of the modeling elements it has been assigned to. The image above, shows that Constraint1 has been assigned to the **bankview** and **com** packages.

4.1.1 Diagram Tree tab

Diagram Tree tab
This tab displays the currently available UModel diagrams in two ways:

- Grouped by diagram type, sorted alphabetically
- As an alphabetical list of all project diagrams

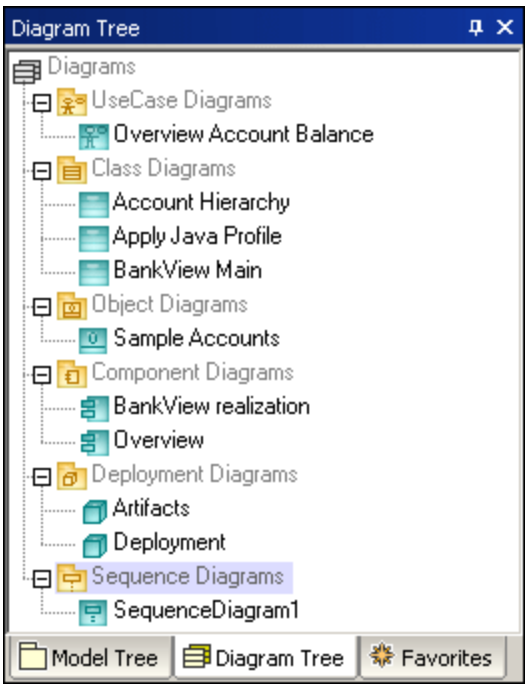
Please note:
Diagrams can be added to, or deleted from, the Diagram Tree tab by right clicking and selecting the requisite command.

To open a diagram in the Diagram tab:

- Double click the diagram you want to view in the diagram tab.

To view all Diagrams within their respective model groups:

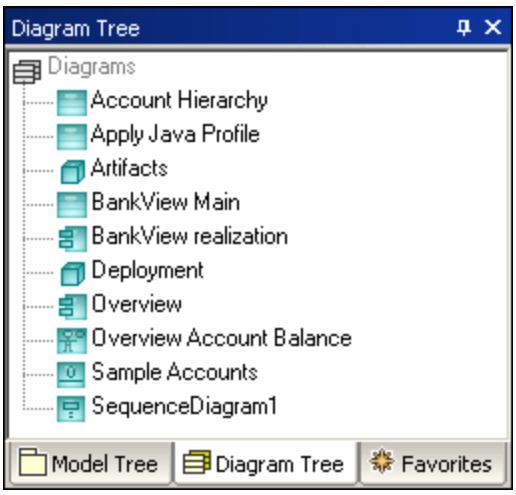
- Right click in the pane, and activate the "Group diagram by diagram type" option.



Diagrams are grouped alphabetically within their group.

To view all Diagram types in list form (alphabetically):

- Right click in the pane, and deactivate the "Group diagram by diagram type" option.



All Diagrams are shown in an alphabetically sorted list.

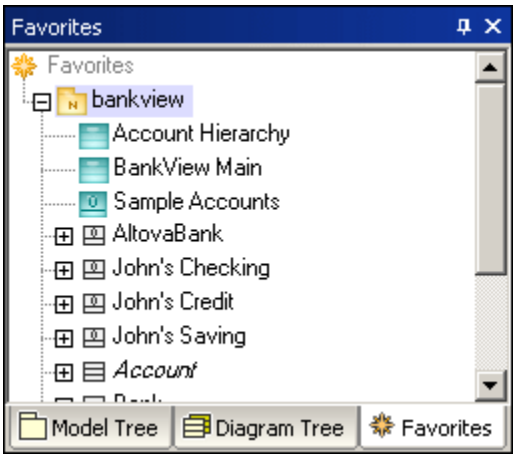
4.1.2 Favorites tab

Favorites tab
Use this tab as a user-defined repository, or library, for all types of **named** UML elements i.e. classes, objects, associations etc. but not ProfileApplication or Generalization dependencies. This allows you to create your personal pick-list of modeling elements for quick access.

The contents of the Favorites tab are automatically saved with each project file. Select the menu option **Tools | Options, File** tab and click the "Load and save with project file" check box to change this setting.

To add an existing modeling element to the Favorites tab:

1. Right click an element in the Model Tree tab, or in the diagram working area.
2. Select the menu item "Add to Favorites".
3. Click the Favorites tab to see the element.



The element appears in the Favorites tab is a view of an existing element, i.e. it is not a copy or clone!

To add a NEW element to the Favorites tab:

1. Right click a previously added package, to which you want to add the element.
2. Select **New | "modeling element"** from the context menu, where "modeling element" is a class, component, or any other modeling element available in the context menu. New elements are added to the same element/package in the project, and are therefore also visible in the Model Tree tab.

To REMOVE an element from the Favorites tab:

1. Right click the same element/package that you added to Favorites.
2. Select **Remove from Favorites**.

Please note:
You can add and remove elements added to the Favorites tab, from the Favorites tab, as well as the Model Tree tab.

Deleting elements from the Favorites tab:

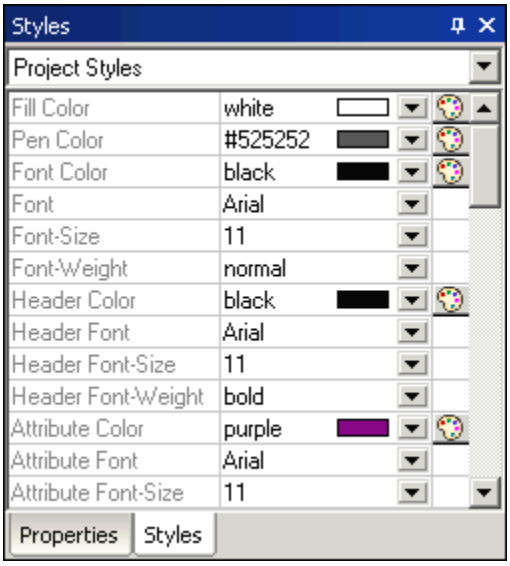
1. Right click the element you want to delete, and press the Del key.
   A message box appears, informing you that the element will be deleted from the project.
2. Click OK if you want to delete it from the project.
3. Click Cancel to retain it, and use the **Remove method** described above, to delete it from the Favorites tab.

4.2 Properties pane

Properties tab
The Properties tab displays the UML properties of the currently active element.

- Clicking **any** model element in any of the supplied views, or tabs, displays its properties.
- Once visible, model properties can be changed, or completed, by entering data, or selecting various options in the tab.
- Selected properties can also be located in the diagram tabs by selecting Show in Active Diagram from the context menu.

Styles tab
The Styles tab is used to view, or change attributes of diagrams, or elements that are displayed in the diagram view.

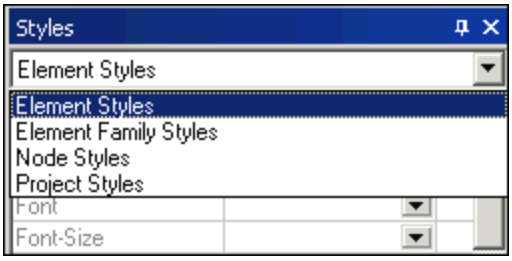


These style attributes fall into two general groups:

- Formatting settings; i.e. font size, weight, color etc.

- Display settings/options; show background color, grid, visibility settings etc.

The Styles tab is subdivided into several different categories/sections which can be selected by clicking the "Styles" combo box. The combo box contents depends on the currently selected model element.



Clicking an element in a diagram tab automatically selects the Element Style context, while clicking and element in the Model Tree tab selects the Project Style context.

Style **precedence** is bottom-up, i.e. changes made at the more specific level override the more general settings. E.g changes (to an object) made at the Element Style level override the current Element Family and Project Styles settings. However, selecting a different object and changing the Element Family Styles setting, updates all other objects except for the one just changed at the Element Style level.

Please note:
Style changes made to model elements can all be undone!

Element Styles:
Applies to the currently selected element in the currently active diagram. Multiple selections are possible.

Element Family Styles:
Applies to all elements of the same type i.e. of the selected Element Family. E.g. you want to have all Component elements colored in aqua. All components in the Component and Deployment diagrams are now in aqua.

Node / Line Styles:
"Node" applies to all rectangular objects.
"Lines" applies to all connectors: association, dependency, realization lines etc. for the whole project.

Project Styles:
Project Styles apply to the current UModel Project in its entirety (e.g. you want to change the default Arial font to Times New Roman for all text in all diagrams of the project).

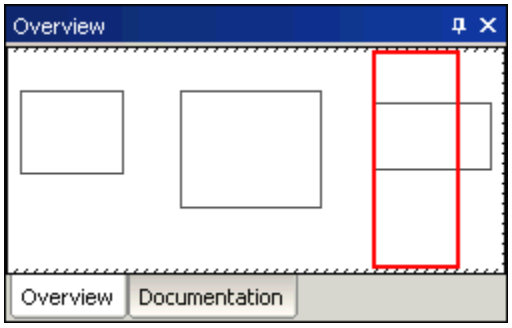
Diagram Styles:
These styles only becomes available when you click/select a diagram background. Changing settings here, only affects the single UML diagram for which the settings are defined in the project.

To change settings for all diagrams of a project:

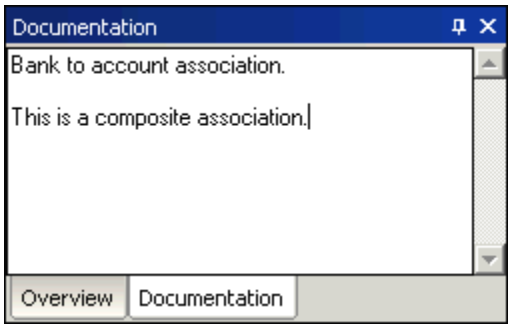
1. Click in the respective diagram,
2. Select the **Project Styles** entry in the combo box, and scroll to the bottom of the tab.
3. Select one of the **Diag.yyy** options e.g. Diag. Background color.
   This then changes the background color of all diagrams in the current project.

4.3 Overview pane

Overview tab
The Overview tab displays an outline view of the currently active diagram. Clicking and dragging the red rectangle, scrolls the diagram view in the diagram tab.



Documentation tab
Allows you to document any of the UML elements available in the Model Tree tab. Click the element you want to document and enter the text in the Documentation tab. The standard editing shortcuts are supported i.e. cut, copy and paste.

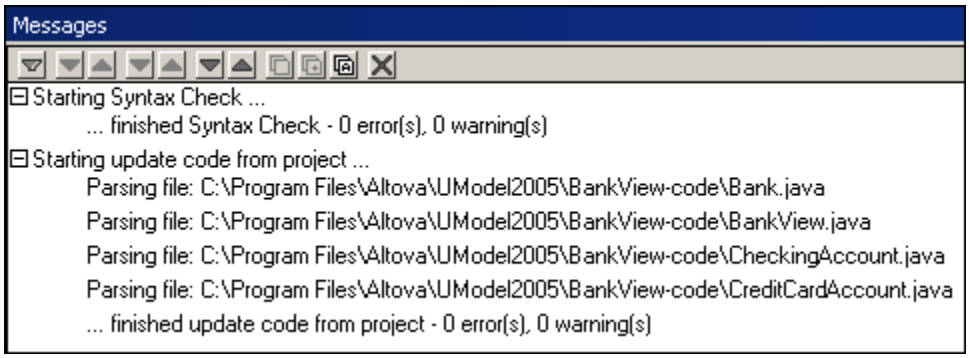


Documentation and code engineering:
During code engineering, only class and interface documentation is input/output. This includes documentation defined for class/interface properties and operations.

1. Select **Project | Synchronization** settings.
2. Activate the "**Write Documentation as JavaDocs"** check box to enable documentation output.

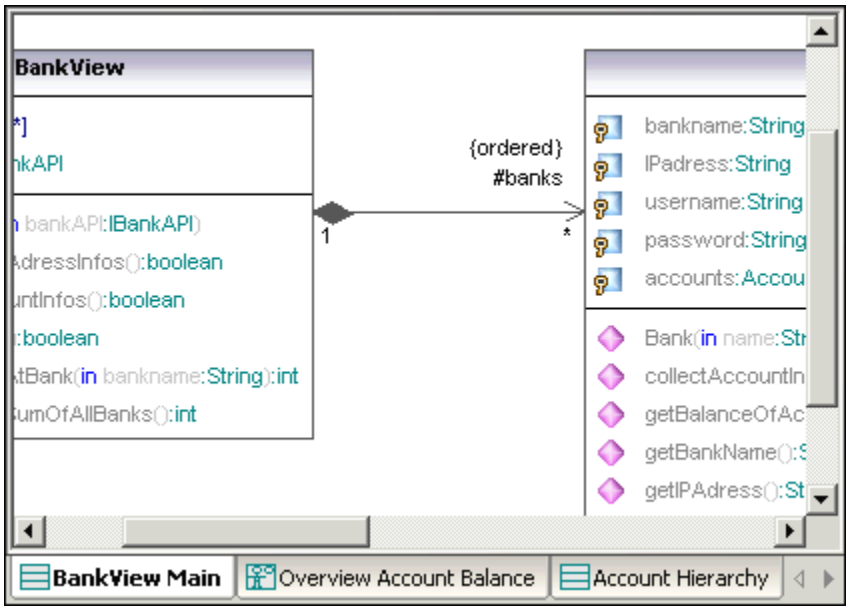
4.4 Messages window

The Messages window displays warnings, hints and error messages when merging code, or checking the project syntax.



4.5 Diagram pane

The diagram pane displays all the currently opened UModel diagrams as individual tabs.



To create a new diagram:

1. Click a package in the Model Tree tab.
2. Select **New | YYY Diagram**.

To create a new diagram containing contents of an existing package:

1. Right click a package and select **Show in new Diagram | Content**.

To open / access a diagram:

- Double click the diagram **icon** in any of the Model Tree pane tabs (to open).
- Clicking any of the tabs in the Diagrams pane (to access).

To close all but the active diagram:

- Right click the diagram tab that is to remain open, select the option **Close All but active**.

Deleting a diagram:

- Click the diagram icon in the Model Tree and press Del. key.

Moving diagrams in a project:

- Drag the diagram icon to any other package in the Model Tree Tab.
  You might have to enable the "no sort" option to move it.

Deleting elements from a diagram:

Delete element from the **diagram** and **project**!

- Select the element you want to delete and press the Del. keyboard key.

Delete element **from diagram only** - not from the project!

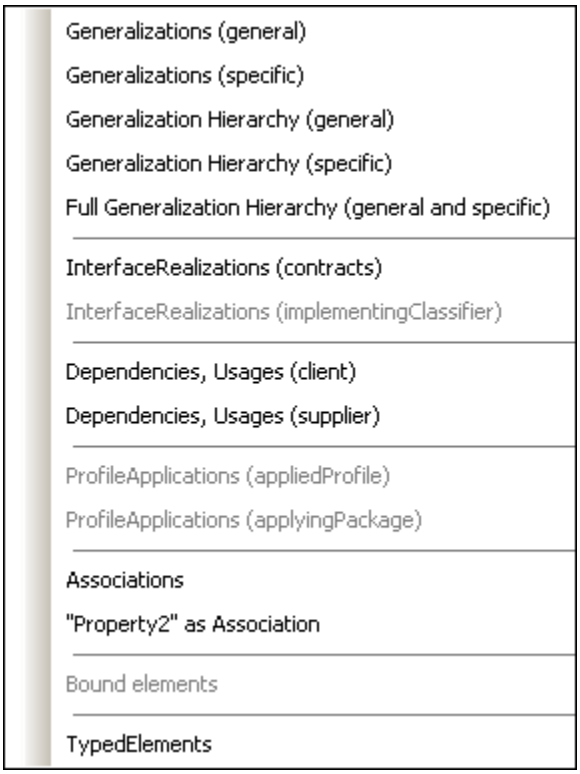
1. Select the element you want to "delete"
2. Hold down the **CTRL** key and press **Del**.

An auto-layout function allows you to define how you would like your diagram to be visually structured. Right click the diagram background and select either:

- Autolayout All | Force directed, or
- Autolayout All | Hierarchic

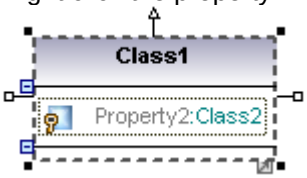
Showing relationships between modeling elements:

1. Right click the specific element and select **Show**.
   The popup menu shown below is context specific, meaning that only those options are available that are relevant to the specific element.

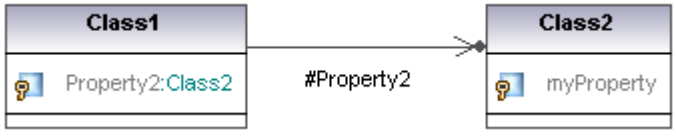


To show a class attribute/property as an association:

1. Right click the property in the class.



2. Select the menu option **Show | "PropertyXX" as Association**.
   This inserts/opens the referenced class and shows the relevant association.



Configuring diagram properties:

Click on the diagram background and then select one of the styles from the Styles combo box. Please see Styles pane for more information.

To enlarge the Diagram size:
The size of the diagram tab is defined by the elements and their placement.

- Drag an element to one of the diagram tab edges to automatically scroll the diagram tab and enlarge it.

4.5.1 Cut, copy and paste in UModel Diagrams

Cut, Copy and Paste of diagram elements within the Diagram pane
All UModel diagram elements can be cut, copied and pasted within, across the same type, and even into other types of diagram tab. Mouse or keyboard shortcuts can be used to achieve this in two different ways:

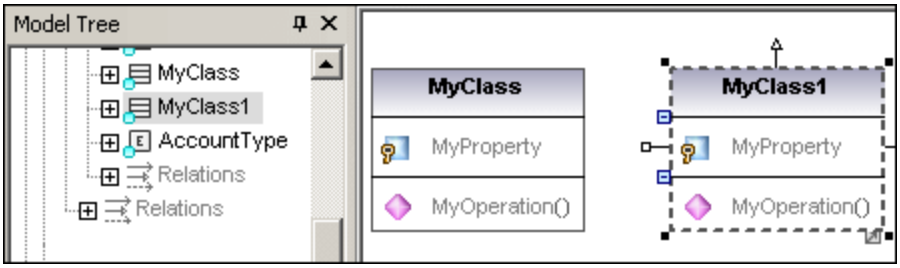
Having copied an element:

- "**Paste**", using the keyboard shortcut CTRL+V, or "Paste" from the context menu, as well as Paste from the Edit menu, always adds a **new** modeling element to the diagram and to the Model Tree.
- "**Paste in diagram only**", using the context menu, i.e. right clicking on the diagram background, only adds a "link/view" of the existing element, to the current diagram and not to the Model Tree.

Using the Class diagram as an example:

Paste (CTRL+V) of a copied class:

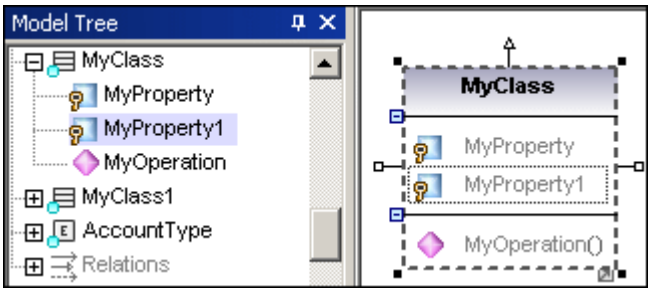
- **Pasting** a copied class in the same diagram (or package), inserts a **new class** with the source class name plus a sequential number. E.g source class name is **myClass**, pasted class name is **myClass1.** All operations and properties are also copied to the new class.



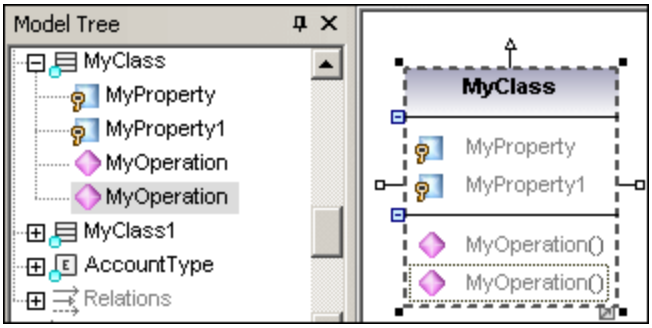
- **Pasting** a copied class into a different package, also inserts a **new** class, but keeps the original class name.
- In both cases the new class is also added to the Model Tree as well.

Paste (CTRL+V) of copied Properties or Operations:

- **Pasting** a Property in the same class, inserts a **new** property with the source property name plus a sequential number e.g. MyProperty1.



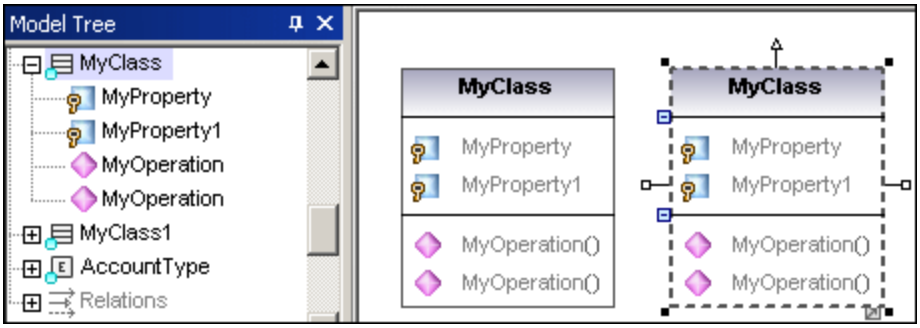
- **Pasting** an Operation in the same class, inserts a **new** operation of the same name as the source operation.



- In both cases a new property/operation is added to the Model Tree.

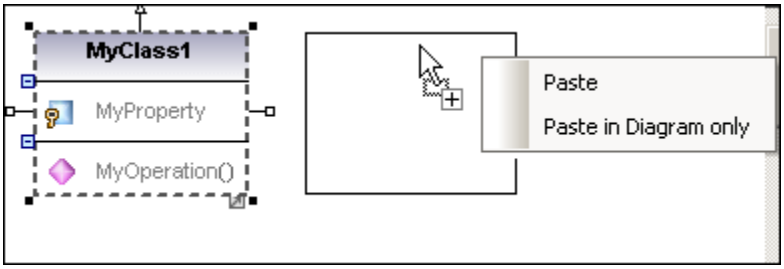
"Paste in Diagram only":
Whenever you use the context menu and select this option, a "link", or "view" to the element is created in the **diagram** you paste it into. Using the Class diagram as an example:

- "Paste in diagram only", creates a "view" to the original class
- The class is inserted into the diagram and displayed exactly as the source class
- A **new** class has **not** been added to the Model Tree!
- No class name or other Operation/Property changes are made
- Changing element properties in one of the "views", changes it in the other one automatically



Copy and pasting of elements using the mouse:

1. Click on the modeling element you want to copy.
2. Move the mouse pointer to the position you want to place the new element.
3. Hold down the CTRL key. A small plus appears below the mouse pointer to signify that this is a copy procedure.
4. Release the mouse button.



A popup menu appears at this point allowing you to select between Paste, and Paste in Diagram only.

5. Select the option that you would like to perform.

Please note:

Using the mouse and CRTL key allows you to copy, or move properties and operations directly within a class.

4.6 Adding/Inserting model elements

Model elements can be created and inserted into diagrams using several methods:

- By adding the elements to specific packages, in the Model Tree view
- By dragging existing elements from the Model Tree tab into the diagram tab
- By clicking a specific UML element icon, and inserting it into the diagram
- By using the context menu to add elements to the diagram (and automatically to the Model Tree view).

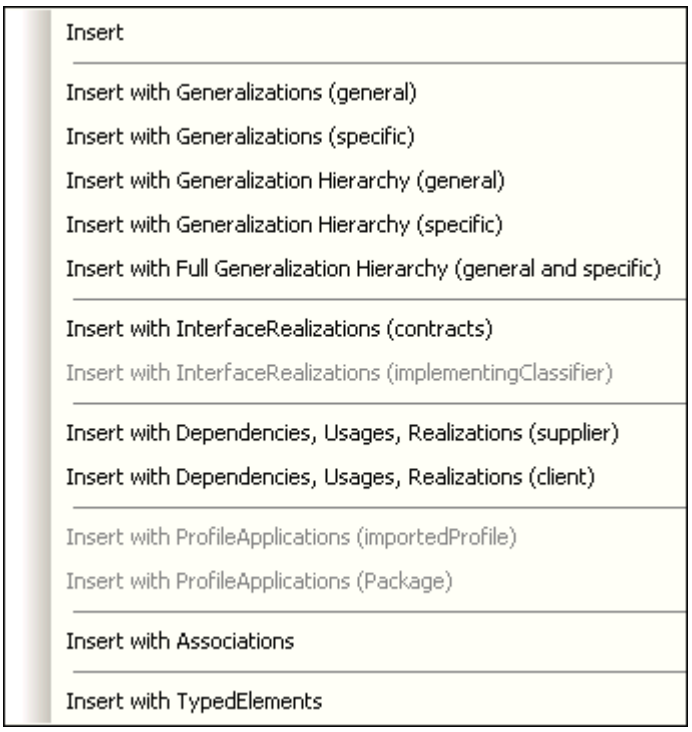
  Please note that multiple elements can be selected in the Model Tree using either SHIFT+click, or CTRL+click.

Adding elements in the Model Tree/Favorites tab:

- Right click a package, select New, and then select the specific element from the flyout menu.
  This adds the new element to the Model Tree tab in the current project.

Inserting elements from the Model Tree view into a diagram:
Model elements can be inserted individually, or as a group. To mark multiple elements use the CTRL key and click each item. There are two different methods of inserting the elements into the diagram: drag left, and drag right.

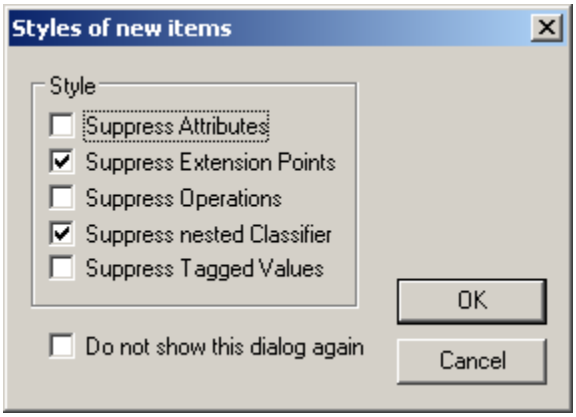
- **Drag left** (normal drag and drop) inserts elements immediately at the cursor position (any associations, dependencies etc. that exist between the currently inserted elements and the new one, are automatically displayed).
- **Drag right** (holding down the right mouse button and releasing it in the diagram tab) opens a popup menu from which you can select the specific associations, generalizations you want to display.



Example:

You want to replicate the Account Hierarchy diagram in a new class diagram.

1. Right click the **bankview** package and select **New | Class Diagram**.
2. Locate the abstract *Account* class in the model tree, and use **drag right** to place it in the new diagram.
   The context menu shown above, is opened.
3. Select the **Insert with Generalization Hierarchy (specific)** item.



4. Deselect the check boxes for specific items you want to appear in the elements (Properties and Operations in this case).
5. Click OK.
   The Account class **and its three subclasses**, are all inserted into the diagram tab. The Generalization arrows are automatically displayed.

Adding elements to a diagram using the icons in the icon bar:

1. Select the specific element you want to insert by clicking the associated icon in the icon bar.
2. Click in the diagram tab to insert the element.

Please note:
Holding down the CTRL key before clicking in the diagram tab, allows you to insert multiple elements of the same type with each individual click in the diagram.

Adding elements to a diagram using the context menu:

- Right click the diagram background and select **New | element name**.

Please note:
Adding new elements directly to the diagram tab, automatically adds the same element to the Model Tree tab. The element is added to the package containing the UML diagram in the Model Tree view.

- Right click an element and select **Show** | **xx**
  E.g. Right clicking the Account class and selecting **Show | Generalization hierarchy**. This then inserts the derived classes into the diagram as well.

4.7 UModel Command line interface

UModel now supports batch-processing. A UModelBatch.exe file is available in the ...\UModel 2006 folder.

The command line parameter syntax is shown below, and can be displayed in the command prompt window by entering: **umodelbatch /?**

Please note:
If the path, or file name contains a space, please use quotes around the path/file name i.e. "c:\Program Files\...\File name"

usage: **umodelbatch** [**project**] [**commands**] [**options**]

/? or /help ... display this help information

project ... project file (*.ump)
/new[=file] ... create new project
/set ... set options permanent
/gui ... display UModel user interface

commands (executed in given order):
/chk ... check project syntax
/isd=path ... import source directory
/isp=file ... import source project (Eclipse *.project | JBuilder *.jpx)
/m2c ... update program code from model (export/forward engineer)
/c2m ... update model from program code (import/reverse engineer)
/ixf=file ... import XMI file
/exf=file ... export to XMI file
/inc=file ... include file
/lue[=cpri] ... list all elements not used on any diagram (i.e. unused)
/ldg ... list all diagrams
/lcl ... list all classes
/lsp ... list all shared packages
/lip ... list all included packages

options for **import commands** (saved with set command):
/iclg[=clg] ... code language (Java1.4 | Java5.0 | C#2.0)
/ipsd[=0|1] ... process sub directories (recursive)
/ijdc[=0|1] ... JavaDocs as comments
/icdc[=0|1] ... DocComments as C# comments
/icds[=lst] ... C# defined symbols
/imrg[=0|1] ... synchronize merged
/iudf[=0|1] ... use directory filter
/iflt[=lst] ... directory filter (presets /iudf)

options for **diagram generation** (saved with set command):
/dgen[=0|1] ... generate diagrams
/dopn[=0|1] ... open generated diagrams
/dmax[=cnt] ... max opened diagrams (presets /dopn)
/dsat[=0|1] ... suppress attributes
/dsop[=0|1] ... suppress operations
/dsnc[=0|1] ... suppress nested classifiers
/dstg[=0|1] ... suppress tagged values

options for **export commands** (saved with set command):
/ejdc[=0|1] ... comments as JavaDocs
/ecdc[=0|1] ... C# comments as DocComments
/espl[=0|1] ... use user defined SPL templates
/ecod[=0|1] ... comment out deleted
/emrg[=0|1] ... synchronize merged
/egfn[=0|1] ... generate missing file names
/eusc[=0|1] ... use syntax check

options for **XMI export**
/exid[=0|1] ... export UUIDs
/exex[=0|1] ... export UModel specific extensions
/exuv[=ver] ... UML version (UML2.0 | UML2.1)

In the projects section:

The **/new** parameter defines the path and file name of the new project file (*.ump).

The **/set** parameter overwrites current default settings in the registry, with the options/settings defined here.

The **/gui** parameter displays the UModel interface during the batch process.

Example 1:
Import source code and create new project file:

```
"C:\Program Files\Altova\UModel2006\UModelBatch.exe" /new="C:\Program Files\Altova\
UModel2006\UModelBatchOut\Fred.ump" /isd="X:TestCases\UModel\Fred" /set /gui
/iclg=Java5.0 /ipsd=1 /ijdc=1 /dgen=1 /dopn=1 /dmax=5 /chk
```

/**new**:	Specifies that the newly-created project file should be called "Fred.ump" in C:\Program Files\Altova\UModel2006\UModelBatchOut\
/**isd**=	Specifies that the root directory to import into should be "X:\TestCases\UModel\Fred"
/**set**:	Specifies that any options used in the command line tool will be saved in the registry (When subsequently starting UModel, these settings become the default settings).
/**gui**:	display the UModel GUI during batch processing
/**iclg**:	UModel will import the code as Java5.0
/**ipsd**=1:	recursively process all subdirectories of the root directory specified in the /**isd** parameter
/**pfd**=1:	creates packages in the UModel project for each imported directory
/**ijdc**=1:	created JavaDoc from comments where appropriate
/**dgen**=1:	generates diagrams
/**dopn**=1:	opens generated diagrams
/**dmax**=5:	will open a maximum of 5 diagrams
/**chk**:	performs a syntax check

Example 2:
Imports source code from X:\TestCases\UModel, and saves the resulting project file in "C:\Program...".

```
"C:\Program Files\Altova\UModel2005\UModelBatch.exe" /new="C:\Program Files\Altova\
UModel2006\UModelBatchOut\finalclass.ump" /isd="X:\TestCases\UModel\
" /iclg=Java5.0 /ipsd=1 /ijdc=1 /dgen=1 /dopn=1 /dmax=5 /dsat=1 /dsnc=1 /chk
```

/**dsat**=1: supresses attributes in the generated diagrams
/**dsnc**=1: suppresses nested classifiers in the generated diagrams

Example 3:
Synchronize code using existing project file (e.g. one of the ones created above).

```
"C:\Program Files\Altova\UModel2005\UModelBatch.exe" "C:\Program Files\Altova\
UModel2006\UModelBatchOut\Fred.ump" /m2c /ejdc=1 /ecod=1 /emrg=1 /egfn=1 /eusc=1
```

"C:\Program Files\Altova\UModel2005\UModelBatchOut\Fred.ump": the project file we want to use.

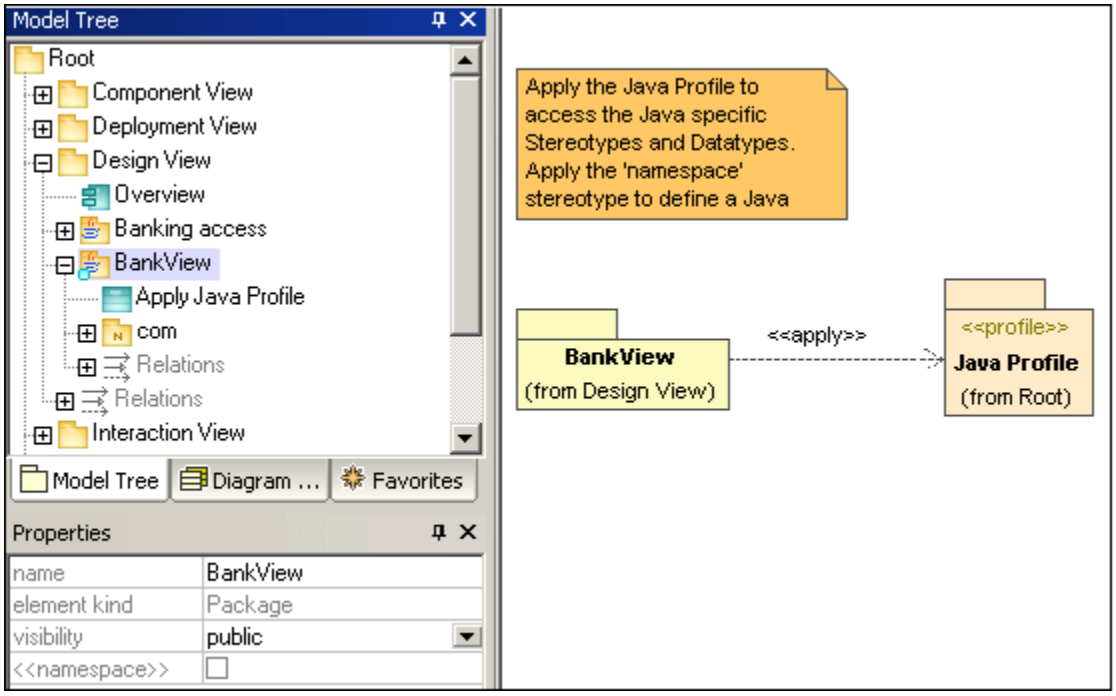
/**m2c**	update the code from the model
/**ejdc**:	comments in the project model should be generated as JavaDoc
/**ecod**=1:	comment out any deleted code
/**emrg**=1	synchronize the merged code
/**egfn**=1:	generate any missing filenames in the project
/**eusc**=1	use the syntax check

4.8 Bank samples

The ...\UModelExamples folder contains sample files which show different aspects of UML modeling in UModel. They are designed to show language specific models for Java, C# and a combination of both languages in one modeling project.

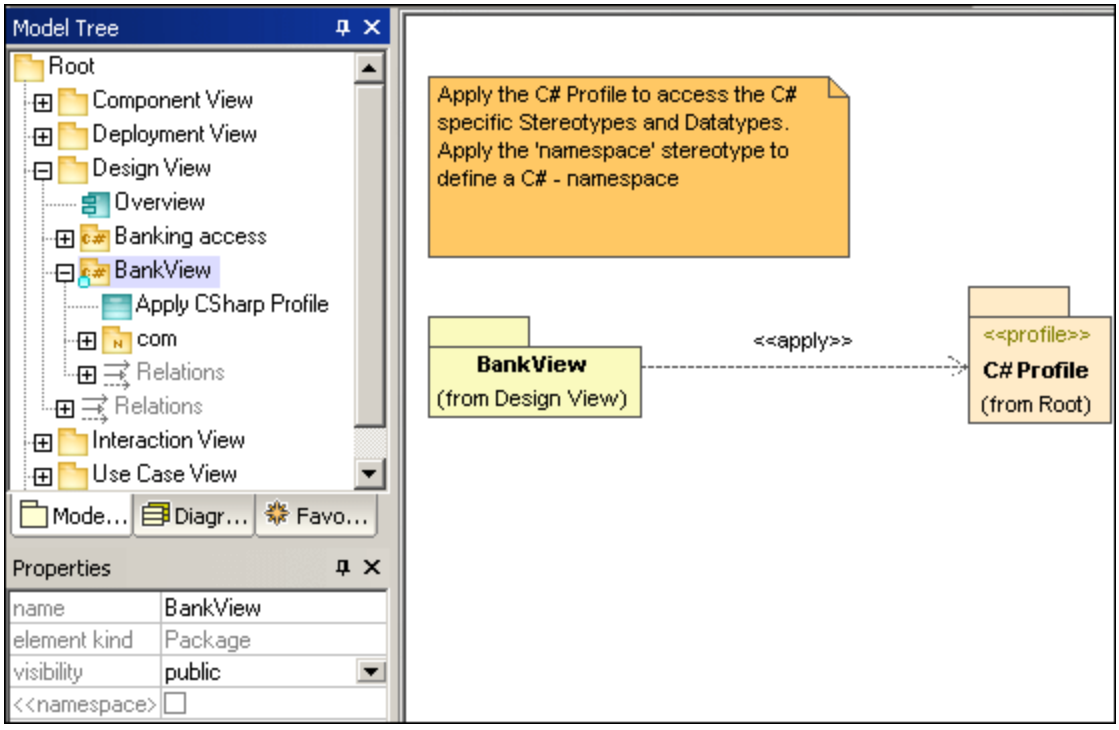
The **Bank_Java.ump** sample file is shown below:

- the Java profile has been assigned to the Bankview package
- the Java namespace root has been assigned to the Banking access and BankView packages.
- the Interaction View package contains two interaction elements which each contain a sequence diagram.



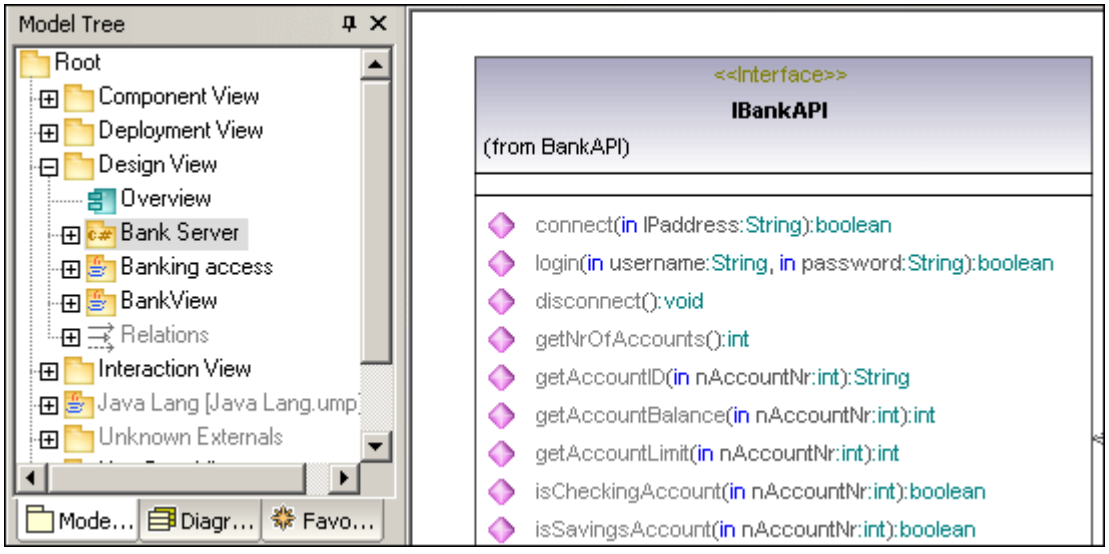
The **Bank_CSharp.ump** sample file is shown below:

- the C# profile has been assigned to the BankView package
- the C# namespace root has been assigned to the Banking access and BankView packages.
- the Interaction View package contains two interaction elements which each contain a sequence diagram.



The **Bank_MultiLanguage.ump** sample file is shown below:

- the Java profile has been assigned to the BankView package
- the C# namespace root has been assigned to the Bank Server package
- the Java namespace root has been assigned to the BankView package.
- the Interaction View package contains two interaction elements which each contain a sequence diagram.



Chapter 5

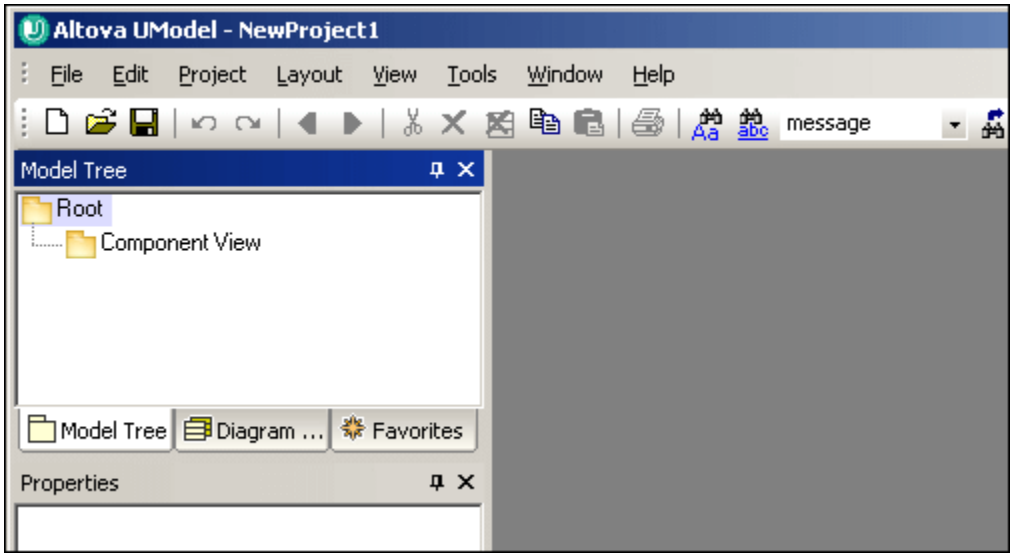
Projects

5 Projects

To create a new project:

1. Click the **New** icon in the icon bar, (or select the menu item **File | New**).

The Root and Component packages are automatically inserted when a new project is created, and are visible in the Model Tree tab. A new project with the default name NewProject1 is created. Note that starting UModel opens a new project automatically.



A newly created UModel project consists of the following packages:

- Root package, and
- Component View package
  These two packages are the only ones that cannot be renamed, or deleted.

All project relevant data is stored in the UModel project file, which has an *.**ump** extension. Each folder symbol in the Model Tree tab represents a UML package!

UModel Project workflow:
UModel does not force you to follow any predetermined modeling sequence!

You can add any type of model element: UML diagram, package, actor etc., to the project in any sequence (and in any position) that you want; Note that all model elements can be inserted, renamed, and deleted in the Model Tree tab itself, you are not even forced to create them as part of a diagram.

To insert a new package:

1. Right click the package you want the new package to appear under, either Root, or Component View in a new project.
2. Select **New | Package**.

   A new package is created under an existing one. The name field is automatically highlighted allowing you to enter the package name immediately.

- Packages are the containers for all other UML modeling elements, use case diagrams, classes, instances etc.
- Packages can be **created**, at any position in the Model Tree.
- Packages/contents can be **moved**/copied to other packages in the Model Tree (as well

as into valid model diagrams in the diagram tab).
- Packages and their contents can be **sorted** (in the Model Tree tab) according to several criteria.
- Packages can be placed within other packages.
- Packages can be used as the **source**, or **target** elements, when merging, or synchronizing code.

To have elements appear in a UML diagram, you have to:

1. Insert a new UML diagram, by right clicking and selecting **New | (Class) Diagram**.
2. Drag and drop an existing model element from the Model Tree into the newly created Diagram, or
3. Use the context menu within the diagram view, to add new elements directly.

To save a project:

Select the menu option **File | Save as...** (or File | Save).

To open a project:

Select the menu option **File | Open,** or select one of the files in the file list.

Please note:

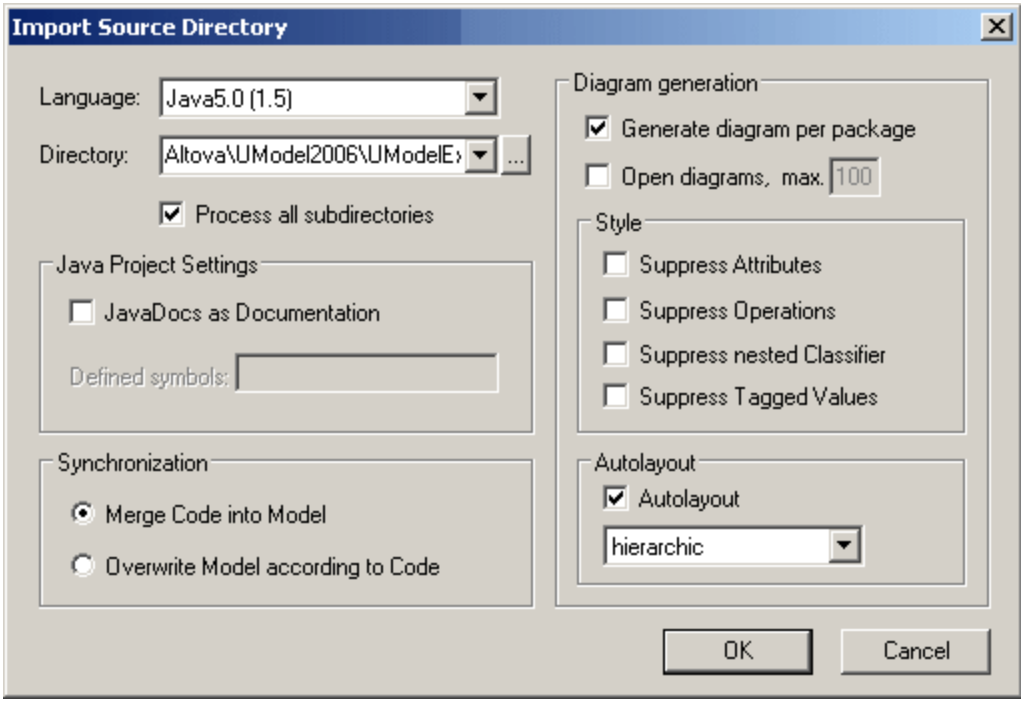
Changes made externally to the project file, or included file(s), are automatically registered and cause a prompt to appear. You can then choose if you want to reload the project or not.

5.1 Importing source code into projects

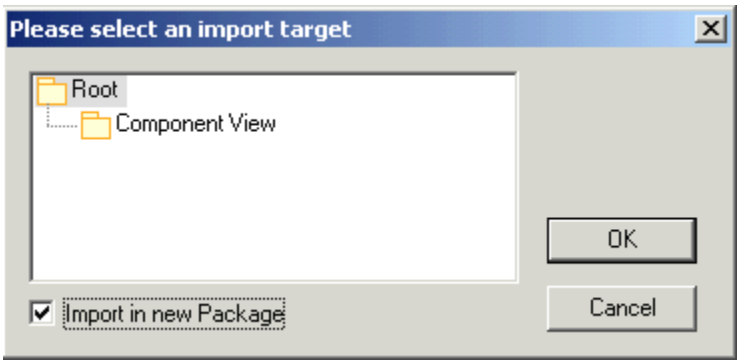
Source code can be imported as a source project or as a source directory. For an example please see Round-trip engineering (code - model - code) in the tutorial.

To import existing code from a directory:

1. Select **Project | Import source directory**.
2. Click the Browse button ... and select the directory that includes the code you want to import.

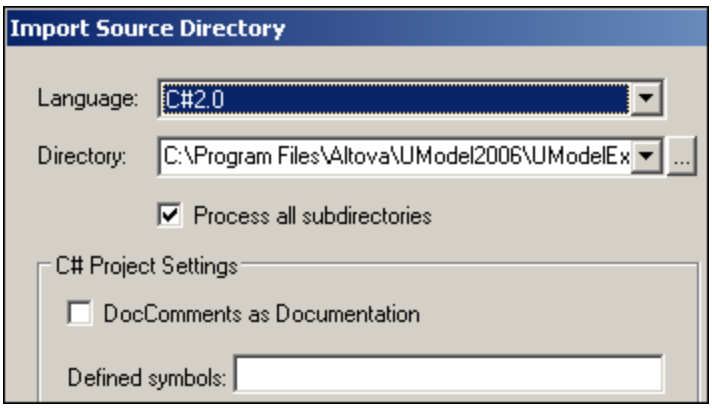


3. Make sure that the "**Generate diagram per package"** check box is active if you want diagrams to be generated for each package.
4. Select any specific import settings you need, and press OK.



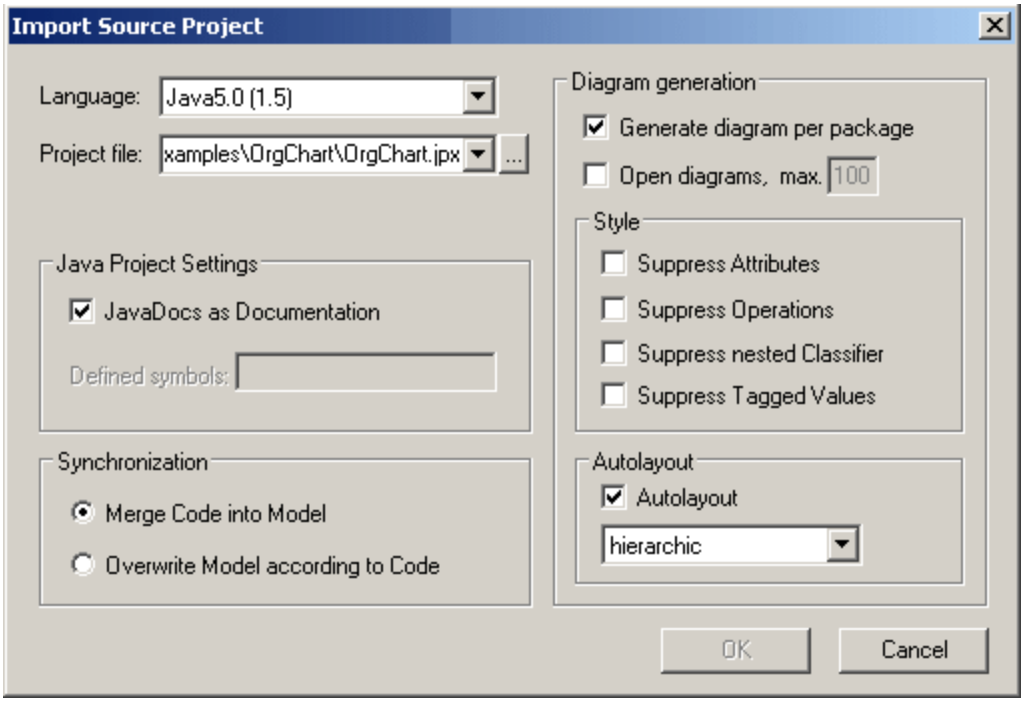
5. Activate the **Import in new Package** check box, or click an existing package in this dialog box, and click OK.
   The data is parsed while being input, and imported into the specified package.

   Please note:
   Selecting C# 2.0 as the import language allows you to define the C# project settings.

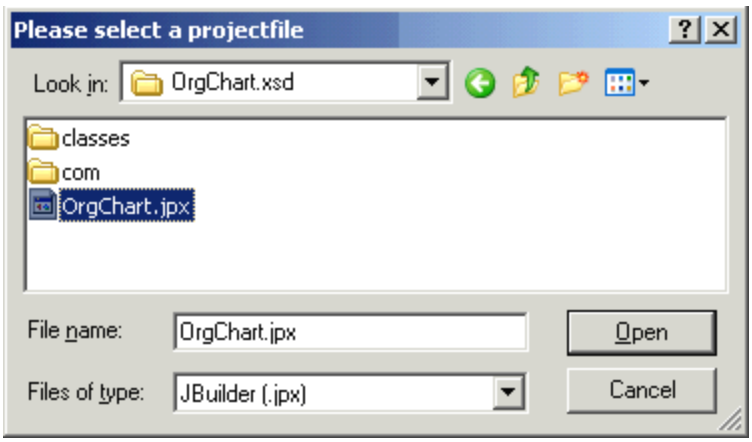


To import an existing project into UModel:

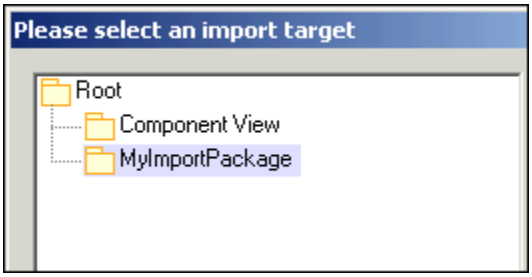
1. Select **Project | Import source project**.
2. Click the browse button ... in the "Import Source Project" dialog box.



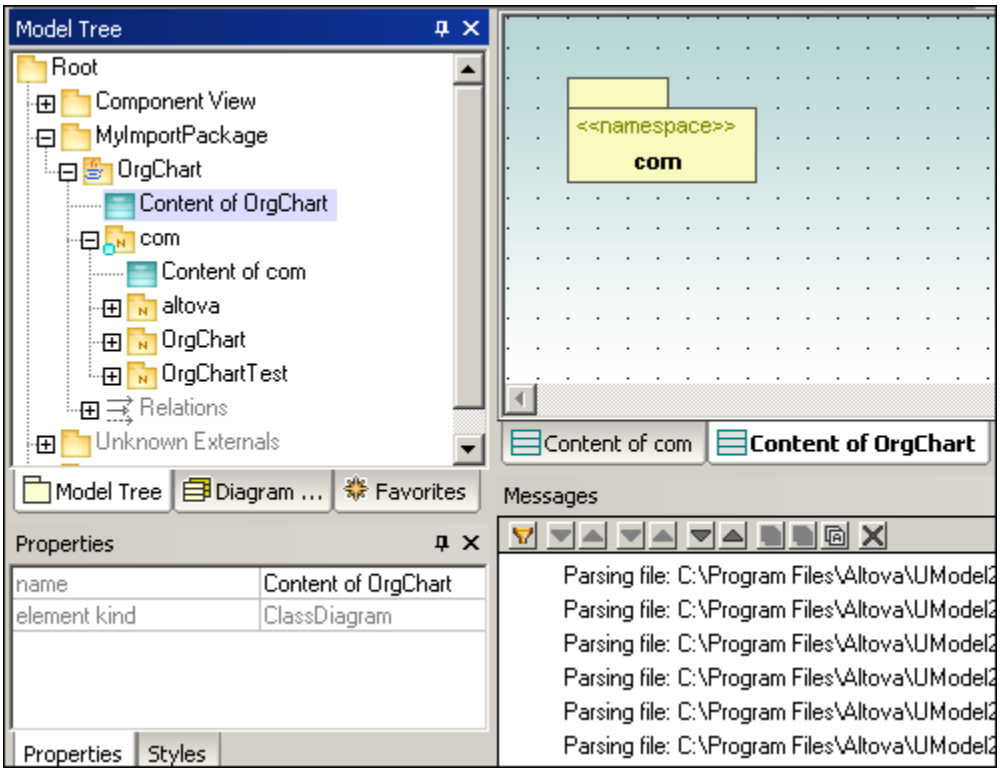
3. Select the project file type e.g. **.jpx** and click Open to confirm.



4. Select any specific import settings you need, and press OK.
5. Select the package you want to import into, e.g. MyImportPackage created using New | Package, and press Enter.

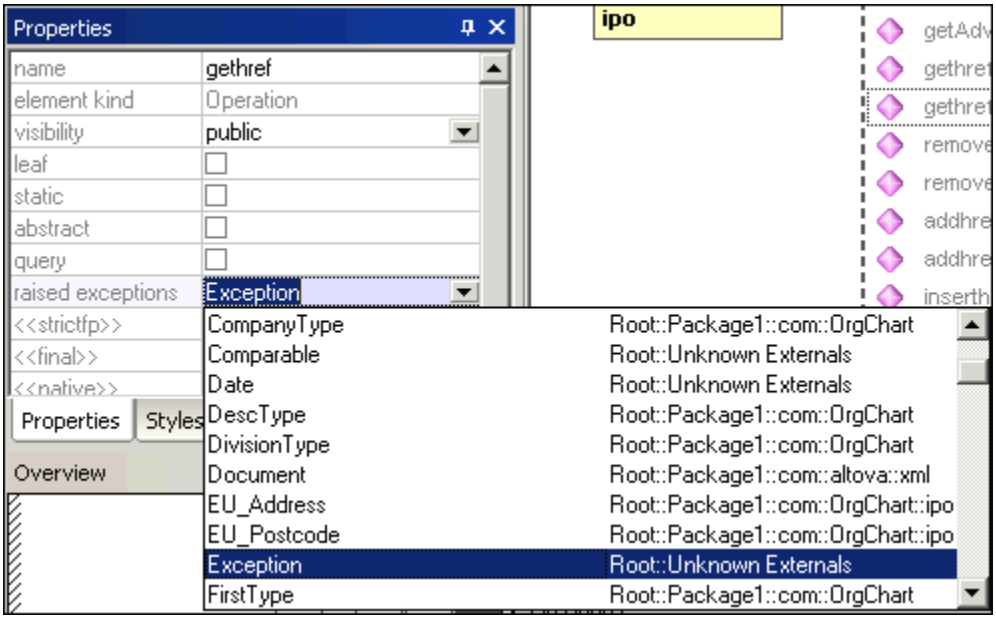


The external project is parsed and the UModel model is generated.



Please note:

Clicking an operation in one of the classes, then clicking the **Exception** combo box, displays the exception information that an operation can throw.



5.2 Synchronizing Model and source code

UModel allows you to synchronize model and code from both sides.

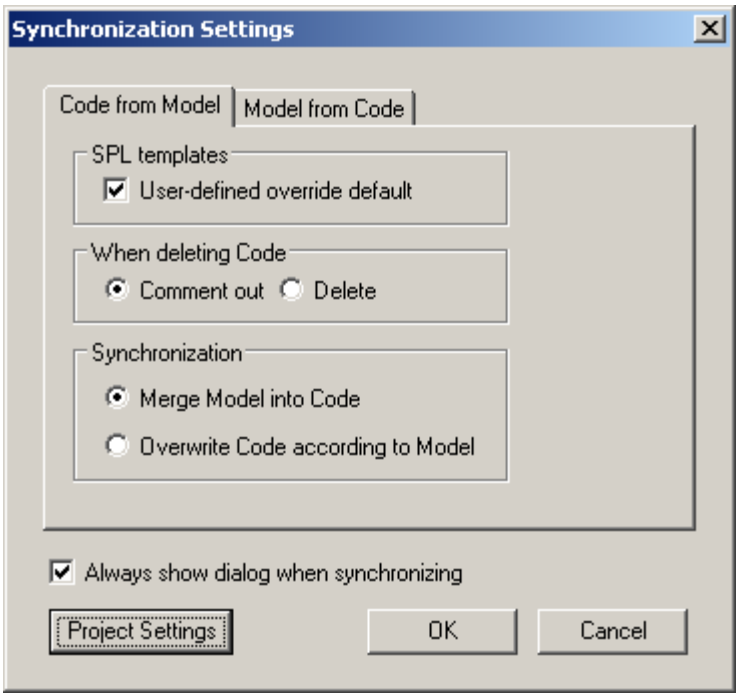
Code / model synchronization:
Code can be merged/synchronized at different levels described below. When using the context menu, e.g. when right clicking a class, the context menu reflects your selection in the menu option. Note that the Project menu only allows you to synchronize at the root/project level.

Project, Root package level:
1. Right click the Root package.
2. Select one of the code merging options: Merge Program..., or Merge UModel project... Alternatively, use the Project menu.

Package level:
1. Use SHIFT, or CTRL + click to select the package(s) you want to merge.
2. Right click the selection, and select one of the code merging options: Merge Program..., or Merge UModel project...

Class level:
1. Use SHIFT, or CTRL + click to select the classes(s) you want to merge.
2. Right click the selection, and select one of the code merging options: Merge Program..., or Merge UModel project...

Define your synchronization options by selecting:
1. **Project | Synchronization options**.
   Each tab allows you to define the specific merge settings.
2. Click the "Project Settings" button to select the specific programming language settings.
3. Define you specific settings and confirm with OK.



Please note:
When synchronizing code, you might be confronted with a dialog box that prompts you to update your UModel project before synchronization.

This only occurs if you are using UModel projects created before the latest release. Please click YES to update your project, and save your project file. This prompt will not occur once this has been done.

SPL Templates:
SPL templates are used during the generation of Java and C# code.

To modify the provided SPL templates:

1. Locate the provided SPL templates in the default directory: ...**UModel2006 \UModelSPL\Java\Default**. (or ...\C#\Default.)
2. Copy the SPL files you want to edit/modify into the **parent** directory, i.e. ...**UModel2006 \UModelSPL\Java**.
3. Make your changes and save them there.

To use the user-defined SPL templates:

1. Select the menu option **Project | Synchronization settings**.
2. Activate the "User-defined override default" checkbox in the SPL templates group.

Then select one of the menu options shown below, to initiate the synchronization process.

- **Project | Merge Program Code from UModel project**, please see Round-trip engineering (model - code - model) for more information, or
- **Project | Merge UModel Project from Project code**, please see Round-trip engineering (code - model - code) for more information.

5.3 Forward engineering prerequisites

Minimum conditions needed to produce code for forward engineering:

- A component must be **realized** by one or more **classes**, or **interfaces**.
- The component must have a **physical location**, i.e. directory, assigned to it. The generated code is then placed in this directory.
- Components must be individually set to be **included** in the code engineering process.
- The Java, or C#, namespace root package must be defined.

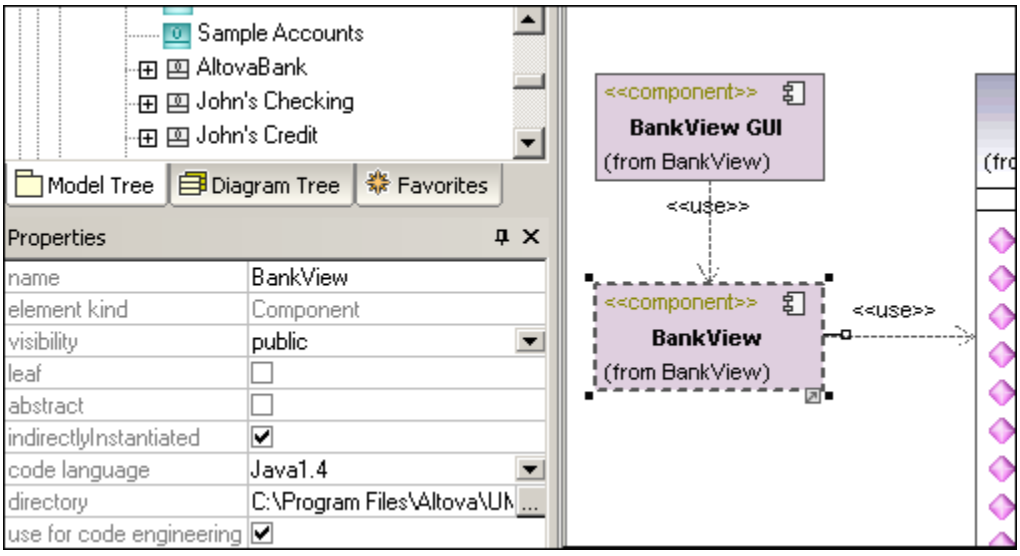
To create a component realization:

1. Drag the class, or interface onto the respective component in the Model Tree view.

   You can also create a realization in a component diagram using the Realization icon.

To assign a physical location:

1. Select the component in the Model Tree, or in the diagram.
2. Click the Browse button ... of the **directory** property and select a directory (or enter it directly).



To include components in the code engineering process:

1. Select the component in the Model Tree, or in the diagram.
2. Activate the "**use for code engineering**" check box.

To define the Java namespace root:

1. Right clicking a package and selecting "Set as Java namespace root" sets the Java namespace root.

   This means that this package and all sub packages, are enabled during the code engineering process. The Java namespace root is denoted with a icon in the Model Tree pane.

- Selecting the command again **removes** the Java namespace for this package.

5.4 Java code to/from UModel elements

The table below shows the one-to-one correspondence between:

- UModel elements and Java code elements, when outputting model to code
- Java code elements and UModel model elements, when inputting code into model

Java ◁▷ UModel								
Java name					**UModel Element name**			
Project	project file				project file			Component
	directory				directory			
Package	name				name			Package <<namespace>>
Class	name				name			Class
	modifiers	package			visibility	package		
		public				public		
		protected				protected		
		private				private		
		abstract			abstract			
		strictfp			<<strictfp>>			
		final			<<final>>			
	file name				code file name			
	associated project file/directory				ComponentRealization			
	extends clause				Generalization			
	implements clause				InterfaceRealization(s)			
	java docs				Comment(->Documentation)			
	Field	name			name			Property
		modifiers	package		visibility	package		
			public			public		
			protected			protected		
			private			private		
			static		static			
			transient		<<transient>>			
			volatile		<<volatile>>			
			final		<<final>>			
		type			type			
		type dimensions			multiplicity			
		default value			default			
		java docs			Comment(->Documentation)			

Java ◁▷ UModel							
Java name				**UModel Element name**			
Class	Method	name		name		Operation	Class
		modifiers	package	visibility	package		
			public		public		
			protected		protected		
			private		private		
			static	static			
			abstract	abstract			
			final	<<final>>			
			native	<<native>>			
			strictfp	<<strictfp>>			
			synchronized	<<synchronized>>			
		throws clause		raised exceptions			
		java docs		Comment(->Documentation)			
		type		direction	return	Parameter	
		Parameter	name	name			
			modifier final	<<final>>			
			...	varArgList			
			type	type			
			type dimensions	multiplicity			
		Type Parameter	name	name		Template Parameter	
			bound	constraining classifier			
	Constructor	name		name			
		modifiers	public	visibility	public		
			protected		protected		
			private		private		
		throws clause		raised exceptions			
		java docs		Comment(->Documentation)			
		Parameter	name	name		Parameter	
			modifier final	<<final>>			
			...	varArgList			
			type	type			
			type dimensions	multiplicity			
		Type Parameter	name	name		Template Parameter	
			bound	constraining classifier			

Java ◁▷ UModel							
Java name				**UModel Element name**			
Interface	name			name			Interface
	modifiers	package		visibility	package		
		public			public		
		protected			protected		
		private			private		
		abstract		abstract			
		strictfp		<<strictfp>>			
	file name			code file name			
	associated project file/directory			ComponentRealization			
	extends clause			Generalization(s)			
	java docs			Comment(->Documentation)			
	Field	name		name		Property	
		modifiers	public	visibility	public		
			static	static			
			final	<<final>>			
		type		type			
		type dimensions		multiplicity			
		default value		default			
		java docs		Comment(->Documentation)			
	Method	name		name		Operation	
		modifiers	public	visibility	public		
			abstract	abstract			
		throws clause		raised exceptions			
		java docs		Comment(->Documentation)			
		type		direction	return	Parameter	
		Parameter	name	name			
			modifier	final	<<final>>		
			...	varArgList			
			type	type			
			type dimensions	multiplicity			
		Type Parameter	name	name		Template Parameter	
			bound	constraining classifier			
	Type Parameter	name		name		Template Parameter	
		bound		constraining classifier			

Java ◁▷ UModel						
Java name			**UModel Element name**			
Enum	name		name			Enumeration
	modifiers	package	visibility	package		
		public		public		
		protected		protected		
		private		private		
	file name		code file name			
	associated project file/directory		ComponentRealization			
	java docs		Comment(->Documentation)			
	Enum Constant	name	name		Enumeration Literal	
	Field	name	name		Property	
		modifiers package	visibility	package		
		public		public		
		protected		protected		
		private		private		
		static	static			
		transient	<<transient>>			
		volatile	<<volatile>>			
		final	<<final>>			
		type	type			
		type dimensions	multiplicity			
		default value	default			
		java docs	Comment(->Documentation)			
	Method	name	name		Operation	
		modifiers package	visibility	package		
		public		public		
		protected		protected		
		private		private		
		static	static			
		abstract	abstract			
		final	<<final>>			
		native	<<native>>			
		strictfp	<<strictfp>>			
		synchronized	<<synchronized>>			

Java ◁▷ UModel							
Java name				UModel Element name			
Enum	Method	throws clause		raised exceptions		Operation	Enumeration
		java docs		Comment(->Documentation)			
		type		direction: return	Parameter		
		Parameter	name	name			
			modifier: final	<<final>>			
			...	varArgList			
			type	type			
			type dimensions	multiplicity			
		Type Parameter	name	name	Template Parameter		
			bound	constraining classifier			
	Constructor	name		name			
		modifiers	public	visibility: public			
			protected	protected			
			private	private			
		throws clause		raised exceptions			
		java docs		Comment(->Documentation)			
		Parameter	name	name	Parameter		
			modifier: final	<<final>>			
			...	varArgList			
			type	type			
			type dimensions	multiplicity			
		Type Parameter	name	name	Template Parameter		
			bound	constraining classifier			
Parameterized Type				Anonymous Bound Element			

5.5 C# code to/from UModel elements

The table below shows the one-to-one correspondence between:

- UModel elements and C# code elements, when outputting model to code
- C# code elements and UModel model elements, when inputting code into model

C# ◁▷ UModel							
C#				UModel			
Project	project file directory			project file directory			Component
Name space	name			name			Package <<name space>>
Class	name			name			Class
	modifiers	internal		visibility	package		
		protected internal			protected <<internal>>		
		public			public		
		protected			protected		
		private			private		
		sealed		leaf			
		abstract		abstract			
		static		<<static>>			
		unsafe		<<unsafe>>			
		partial		<<partial>>			
		new		<<new>>			
	file name			code file name			
	associated project file/directory			ComponentRealization			
	base types			Generalization, InterfaceRealization(s)			
	attribute sections			<<attributes>>			
	doc comments			Comment(->Documentation)			
	Field	name		name			Property
		modifiers	internal	visibility	package		
			protected internal		protected <<internal>>		
			public		public		
			protected		protected		
			private		private		
			static	static			
			readonly	readonly			
			volatile	<<volatile>>			
			unsafe	<<unsafe>>			
			new	<<new>>			
		type		type			
		type dimensions		multiplicity			
		type pointer		type modifier			
		nullable		<<nullable>>			
		default value		default			
		attribute sections		<<attributes>>			
		doc comments		Comment(->Documentation)			

C# ◁▷ UModel									
C#					UModel				
Class	Constant	name			name			Property <<const>>	Class
		modifiers	internal		visibility	package			
			protected internal			protected <<internal>>			
			public			public			
			protected			protected			
			private			private			
			new		<<new>>				
		type			type				
		type dimensions			multiplicity				
		type pointer			type modifier				
		nullable			<<nullable>>				
		default value			default				
		attribute sections			<<attributes>>				
		doc comments			Comment(->Documentation)				
	Method	name			name			Operation	
		modifiers	internal		visibility	package			
			protected internal			protected <<internal>>			
			public			public			
			protected			protected			
			private			private			
			static		static				
			abstract		abstract				
			sealed		leaf				
			override		<<override>>				
			virtual		<<virtual>>				
			new		<<new>>				
			unsafe		<<unsafe>>				
		attribute sections			<<attributes>>				
		doc comments			Comment(->Documentation)				
		type			direction	return			
		Parameter	name		name		Parameter		
			modifiers	ref	direction	inout			
				out		out			
				params	varArgList				
			type		type				
			type dimensions		multiplicity				
			type pointer		type modifier				
			nullable		<<nullable>>				
		Type Parameter	name		name		Template Parameter		
			constraint		constraining classifier				
			predefined constraint	struct	<<ValueTypeConstraint>>				
				class	<<ReferenceTypeConstraint>>				
				new()	<<ConstructorConstraint>>				
			attribute sections		<<attributes>>				

C# ◁▷ UModel											
C#							UModel				
Class	Constructor	name					name			Operation	Class
		modifiers	internal				visibility	package			
			protected internal					protected <<internal>>			
			public					public			
			protected					protected			
			private					private			
			static				static				
			unsafe				<<unsafe>>				
		attribute sections					<<attributes>>				
		doc comments					Comment(->Documentation)				
		Parameter	name				name			Parameter	
			modifiers	ref			direction	inout			
				out				out			
				params			varArgList				
			type				type				
			type dimensions				multiplicity				
			type pointer				type modifier				
			nullable				<<nullable>>				
	Destructor	name					name			Operation	
		modifiers	private				visibility	private			
			unsafe				<<unsafe>>				
		attribute sections					<<attributes>>				
		doc comments					Comment(->Documentation)				
	Property	name					name			Operation <<property>>	
		modifiers	internal				visibility	package			
			protected internal					protected <<internal>>			
			public					public			
			protected					protected			
			private					private			
			static				static				
			abstract				abstract				
			sealed				leaf				
			override				<<override>>				
			virtual				<<virtual>>				
			new				<<new>>				
			unsafe				<<unsafe>>				
		attribute sections					<<attributes>>				
		doc comments					Comment(->Documentation)				
		type					direction	return		Parameter	
		type dimensions					multiplicity				
		nullable					<<nullable>>				
		Get Accessor	modifiers	internal			visibility	package		<<GetAccessor>>	
				protected internal				protected internal			
				protected				protected			
				private				private			

<table>
<tr><th colspan="11">C# ◁▷ UModel</th></tr>
<tr><th colspan="6">C#</th><th colspan="5">UModel</th></tr>
<tr><td rowspan="13">Class</td><td rowspan="4">Property</td><td rowspan="4">Set Accessor</td><td rowspan="4">modifiers</td><td>internal</td><td rowspan="4">visibility</td><td>package</td><td rowspan="4"><<SetAccessor>></td><td rowspan="4">Operation <<property>></td><td rowspan="13">Class</td></tr>
<tr><td>protected internal</td><td>protected internal</td></tr>
<tr><td>protected</td><td>protected</td></tr>
<tr><td>private</td><td>private</td></tr>
<tr><td rowspan="8">Operator</td><td colspan="3">name</td><td colspan="3">name</td><td rowspan="8">Operation <<operator>></td></tr>
<tr><td rowspan="3">modifiers</td><td>public</td><td colspan="2">visibility</td><td>public</td></tr>
<tr><td>static</td><td colspan="3">static</td></tr>
<tr><td>unsafe</td><td colspan="3"><<unsafe>></td></tr>
<tr><td colspan="3">attribute sections</td><td colspan="3"><<attributes>></td></tr>
<tr><td colspan="3">doc comments</td><td colspan="3">Comment(->Documentation)</td></tr>
<tr><td colspan="3">type</td><td>direction</td><td>return</td><td rowspan="6">Parameter</td></tr>
<tr><td rowspan="6">Parameter</td><td>name</td><td colspan="2">name</td></tr>
<tr><td>modifier</td><td>params</td><td colspan="2">varArgList</td></tr>
<tr><td>type</td><td colspan="2">type</td></tr>
<tr><td>type dimensions</td><td colspan="2">multiplicity</td></tr>
<tr><td>type pointer</td><td colspan="2">type modifier</td></tr>
<tr><td>nullable</td><td colspan="2"><<nullable>></td></tr>
<tr><td rowspan="15">Indexer</td><td colspan="3">name (="this")</td><td colspan="3">name (="this")</td><td rowspan="15">Operation <<indexer>></td></tr>
<tr><td rowspan="10">modifiers</td><td>internal</td><td rowspan="5">visibility</td><td>package</td></tr>
<tr><td>protected internal</td><td>protected <<internal>></td></tr>
<tr><td>public</td><td>public</td></tr>
<tr><td>protected</td><td>protected</td></tr>
<tr><td>private</td><td>private</td></tr>
<tr><td>static</td><td colspan="2">static</td></tr>
<tr><td>abstract</td><td colspan="2">abstract</td></tr>
<tr><td>sealed</td><td colspan="2">leaf</td></tr>
<tr><td>override</td><td colspan="2"><<override>></td></tr>
<tr><td>virtual</td><td colspan="2"><<virtual>></td></tr>
<tr><td>new</td><td colspan="2"><<new>></td></tr>
<tr><td>unsafe</td><td colspan="2"><<unsafe>></td></tr>
<tr><td colspan="3">attribute sections</td><td colspan="3"><<attributes>></td></tr>
<tr><td colspan="3">doc comments</td><td colspan="3">Comment(->Documentation)</td></tr>
<tr><td colspan="3">type</td><td>direction</td><td>return</td><td rowspan="6">Parameter</td></tr>
<tr><td rowspan="6">Parameter</td><td>name</td><td colspan="2">name</td></tr>
<tr><td>modifier</td><td>params</td><td colspan="2">varArgList</td></tr>
<tr><td>type</td><td colspan="2">type</td></tr>
<tr><td>type dimensions</td><td colspan="2">multiplicity</td></tr>
<tr><td>type pointer</td><td colspan="2">type modifier</td></tr>
<tr><td>nullable</td><td colspan="2"><<nullable>></td></tr>
</table>

<table>
<tr><th colspan="11">C# ◁▷ UModel</th></tr>
<tr><th colspan="6">C#</th><th colspan="5">UModel</th></tr>
<tr><td rowspan="11">Class</td><td rowspan="6">Indexer</td><td rowspan="5">Get Accessor</td><td rowspan="5">modifiers</td><td>internal</td><td rowspan="5">visibility</td><td>package</td><td rowspan="5"><<Get Accessor>></td><td rowspan="6">Operation <<indexer>></td><td rowspan="11">Class</td></tr>
<tr><td>protected internal</td><td>protected internal</td></tr>
<tr><td>protected</td><td>protected</td></tr>
<tr><td>private</td><td>private</td></tr>
<tr><td rowspan="5">Set Accessor</td><td rowspan="5">modifiers</td><td>internal</td><td rowspan="5">visibility</td><td>package</td><td rowspan="5"><<SetAccessor>></td></tr>
<tr><td>protected internal</td><td>protected internal</td></tr>
<tr><td>protected</td><td>protected</td></tr>
<tr><td>private</td><td>private</td></tr>
<tr><td rowspan="15">Event</td><td colspan="2">name</td><td colspan="3">name</td><td rowspan="15">Operation <<event>></td></tr>
<tr><td rowspan="10">modifiers</td><td>internal</td><td rowspan="5">visibility</td><td>package</td></tr>
<tr><td>protected internal</td><td>protected <<internal>></td></tr>
<tr><td>public</td><td>public</td></tr>
<tr><td>protected</td><td>protected</td></tr>
<tr><td>private</td><td>private</td></tr>
<tr><td>static</td><td colspan="3">static</td></tr>
<tr><td>abstract</td><td colspan="3">abstract</td></tr>
<tr><td>sealed</td><td colspan="3">leaf</td></tr>
<tr><td>override</td><td colspan="3"><<override>></td></tr>
<tr><td>virtual</td><td colspan="3"><<virtual>></td></tr>
<tr><td>new</td><td colspan="3"><<new>></td></tr>
<tr><td>unsafe</td><td colspan="3"><<unsafe>></td></tr>
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<tr><td colspan="2">doc comments</td><td colspan="3">Comment(->Documentation)</td></tr>
<tr><td colspan="2">type</td><td>direction</td><td>return</td><td rowspan="3">Parameter</td></tr>
<tr><td colspan="2">type dimensions</td><td colspan="2">multiplicity</td></tr>
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<tr><td colspan="2">Add Accessor
Remove Accessor</td><td colspan="3"><<AddRemoveAccessor>></td></tr>
<tr><td rowspan="5">Type Parameter</td><td colspan="2">name</td><td colspan="3">name</td><td rowspan="5">Template Parameter</td></tr>
<tr><td colspan="2">constraint</td><td colspan="3">constraining classifier</td></tr>
<tr><td rowspan="3">predefined constraint</td><td>struct</td><td colspan="3"><<ValueTypeConstraint>></td></tr>
<tr><td>class</td><td colspan="3"><<ReferenceTypeConstraint>></td></tr>
<tr><td>new()</td><td colspan="3"><<ConstructorConstraint>></td></tr>
<tr><td colspan="2">attribute sections</td><td colspan="3"><<attributes>></td></tr>
</table>

C# ◁▷ UModel							
C#				UModel			
Class	name			name			Class
	modifiers	internal		visibility	package		
		protected internal			protected <<internal>>		
		public			public		
		protected			protected		
		private			private		
		unsafe		<<unsafe>>			
		partial		<<partial>>			
		new		<<new>>			
	file name			code file name			
	associated project file/directory			ComponentRealization			
	base types			InterfaceRealization(s)			
	attribute sections			<<attributes>>			
	doc comments			Comment(->Documentation)			
	Field	name		name			Property
		modifiers	internal	visibility	package		
			protected internal		protected <<internal>>		
			public		public		
			protected		protected		
			private		private		
			static	static			
			readonly	readonly			
			volatile	<<volatile>>			
			unsafe	<<unsafe>>			
			new	<<new>>			
		type		type			
		type dimensions		multiplicity			
		type pointer		type modifier			
		nullable		<<nullable>>			
		default value		default			
		attribute sections		<<attributes>>			
		doc comments		Comment(->Documentation)			
	Constant	name		name			Property <<const >>
		modifiers	internal	visibility	package		
			protected internal		protected <<internal>>		
			public		public		
			protected		protected		
			private		private		
			new	<<new>>			
		type		type			
		type dimensions		multiplicity			

C# ◁▷ UModel									
C#					UModel				
Class	Constant	type pointer			type modifier			Property <<const>>	Class
		nullable			<<nullable>>				
		default value			default				
		attribute sections			<<attributes>>				
		doc comments			Comment(->Documentation)				
	Fixedsize Buffer	name			name			Property <<fixed>>	
		modifiers	internal		visibility	package			
			protected internal			protected <<internal>>			
			public			public			
			protected			protected			
			private			private			
			unsafe		<<unsafe>>				
			new		<<new>>				
		type			type				
		type pointer			type modifier				
		nullable			<<nullable>>				
		buffer size			default				
		attribute sections			<<attributes>>				
		doc comments			Comment(->Documentation)				
	Method	name			name			Operation	
		modifiers	internal		visibility	package			
			protected internal			protected <<internal>>			
			public			public			
			protected			protected			
			private			private			
			static		static				
			abstract		abstract				
			sealed		leaf				
			override		<<override>>				
			virtual		<<virtual>>				
			new		<<new>>				
			unsafe		<<unsafe>>				
		attribute sections			<<attributes>>				
		doc comments			Comment(->Documentation)				
		type			direction	return	Parameter		
		Parameter	name		name				
			modifiers	ref	direction	inout			
				out		out			
				params	varArgList				
			type		type				
			type dimensions		multiplicity				
			type pointer		type modifier				
			nullable		<<nullable>>				

C# ◁▷ UModel									
C#						UModel			
Struct	Method	Type Parameter	name			name	Template Parameter	Operation	Class <<struct>>
			constraint			constraining classifier			
			predefined constraint	struct		<<ValueTypeConstraint>>			
				class		<<ReferenceTypeConstraint>>			
				new()		<<ConstructorConstraint>>			
			attribute sections			<<attributes>>			
	Constructor	name				name		Operation	
		modifiers	internal			visibility	package		
			protected internal				protected <<internal>>		
			public				public		
			protected				protected		
			private				private		
			static			static			
			unsafe			<<unsafe>>			
		attribute sections				<<attributes>>			
		doc comments				Comment(->Documentation)			
		Parameter	name			name	Parameter		
			modifiers	ref		direction	inout		
				out			out		
				params		varArgList			
			type			type			
			type dimensions			multiplicity			
			type pointer			type modifier			
			nullable			<<nullable>>			
	Destructor	name				name		Operation	
		modifiers	private			visibility	private		
			unsafe			<<unsafe>>			
		attribute sections				<<attributes>>			
		doc comments				Comment(->Documentation)			
	Property	name				name		Operation <<property>>	
		modifiers	internal			visibility	package		
			protected internal				protected <<internal>>		
			public				public		
			protected				protected		
			private				private		
			static			static			
			abstract			abstract			
			sealed			leaf			
			override			<<override>>			
			virtual			<<virtual>>			
			new			<<new>>			
			unsafe			<<unsafe>>			
		attribute sections				<<attributes>>			
		doc comments				Comment(->Documentation)			

C# ◁▷ UModel											
C#					UModel						
Struct	Property	type			direction	return	Parameter	Operation <<property>>	Class <<struct>>		
		type dimensions			multiplicity						
		nullable			<<nullable>>						
		Get Accessor	modifiers	internal	visibility	package	<<GetAccessor>>				
				protected internal		protected internal					
				protected		protected					
				private		private					
		Set Accessor	modifiers	internal	visibility	package	<<SetAccessor>>				
				protected internal		protected internal					
				protected		protected					
				private		private					
	Operator	name			name			Operation <<operator>>			
		modifiers	public		visibility	public					
			static		static						
			unsafe		<<unsafe>>						
		attribute sections			<<attributes>>						
		doc comments			Comment(->Documentation)						
		type			direction	return	Parameter				
		Parameter	name		name						
			modifier	params	varArgList						
			type		type						
			type dimensions		multiplicity						
			type pointer		type modifier						
			nullable		<<nullable>>						
	Indexer	name (="this")			name (="this")			Operation <<indexer>>			
		modifiers	internal		visibility	package					
			protected internal			protected <<internal>>					
			public			public					
			protected			protected					
			private			private					
			static		static						
			abstract		abstract						
			sealed		leaf						
			override		<<override>>						
			virtual		<<virtual>>						
			new		<<new>>						
			unsafe		<<unsafe>>						
		attribute sections			<<attributes>>						
		doc comments			Comment(->Documentation)						
		type			direction	return	Parameter				
		Parameter	name		name						
			modifier	params	varArgList						
			type		type						
			type dimensions		multiplicity						
			type pointer		type modifier						
			nullable		<<nullable>>						

C# ◁▷ UModel									
C#					UModel				
Struct	Indexer	Get Accessor	modifiers	internal	visibility	package	<<GetAccessor>>	Operation <<indexer>>	Class <<struct>>
				protected internal		protected internal			
				protected		protected			
				private		private			
		Set Accessor	modifiers	internal	visibility	package	<<SetAccessor>>		
				protected internal		protected internal			
				protected		protected			
				private		private			
	Event	name			name			Operation <<event>>	
		modifiers		internal	visibility	package			
				protected internal		protected <<internal>>			
				public		public			
				protected		protected			
				private		private			
				static	static				
				abstract	abstract				
				sealed	leaf				
				override	<<override>>				
				virtual	<<virtual>>				
				new	<<new>>				
				unsafe	<<unsafe>>				
		attribute sections			<<attributes>>				
		doc comments			Comment(->Documentation)				
		type			direction	return	Parameter		
		type dimensions			multiplicity				
		nullable			<<nullable>>				
		Add Accessor			<<AddRemoveAccessor>>				
		Remove Accessor							
	Type Parameter	name			name			Template Parameter	
		constraint			constraining classifier				
		predefined constraint		struct	<<ValueTypeConstraint>>				
				class	<<ReferenceTypeConstraint>>				
				new()	<<ConstructorConstraint>>				
		attribute sections			<<attributes>>				
Interface	name				name				Interface
	modifiers	internal			visibility	package			
		protected internal				protected <<internal>>			
		public				public			
		protected				protected			
		private				private			
		unsafe			<<unsafe>>				

C# ◁▷ UModel										
C#							UModel			
Interface		partial					<<partial>>			Interface
		new					<<new>>			
	file name						code file name			
	associated project file/directory						ComponentRealization			
	base types						Generalization(s)			
	attribute sections						<<attributes>>			
	doc comments						Comment(->Documentation)			
	Method	name					name			Operation
		modifiers	public				visibility	public		
			new				<<new>>			
			unsafe				<<unsafe>>			
		attribute sections					<<attributes>>			
		doc comments					Comment(->Documentation)			
		type					direction	return	Parameter	
		Parameter	name				name			
			modifiers	ref			direction	inout		
				out				out		
				params			varArgList			
			type				type			
			type dimensions				multiplicity			
			type pointer				type modifier			
			nullable				<<nullable>>			
		Type Parameter	name				name		Template Parameter	
			constraint				constraining classifier			
			predefined constraint	struct			<<ValueTypeConstraint>>			
				class			<<ReferenceTypeConstraint>>			
				new()			<<ConstructorConstraint>>			
			attribute sections				<<attributes>>			
	Property	name					name			Operation <<property>>
		modifiers	public				visibility	public		
			new				<<new>>			
			unsafe				<<unsafe>>			
		attribute sections					<<attributes>>			
		doc comments					Comment(->Documentation)			
		type					direction	return	Parameter	
		type dimensions					multiplicity			
		nullable					<<nullable>>			
		Get Accessor	modifiers	internal			visibility	package	<<GetAccessor>>	
				protected internal				protected internal		
				protected				protected		
				private				private		
		Set Accessor	modifiers	internal			visibility	package	<<SetAccessor>>	
				protected internal				protected internal		
				protected				protected		
				private				private		

C# ◁▷ UModel										
C#							UModel			
Interface	Indexer	name (="this")					name (="this")			Interface
		modifiers	public				visibility	public		
			new				<<new>>			
			unsafe				<<unsafe>>			
		attribute sections					<<attributes>>			
		doc comments					Comment(->Documentation)			
		type					direction	return	Parameter	Operation <<indexer>>
		Parameter	name				name			
			modifier	params			varArgList			
			type				type			
			type dimensions				multiplicity			
			type pointer				type modifier			
			nullable				<<nullable>>			
		Get Accessor	modifiers	internal			visibility	package	<<GetAccessor>>	
				protected internal				protected internal		
				protected				protected		
				private				private		
		Set Accessor	modifiers	internal			visibility	package	<<SetAccessor>>	
				protected internal				protected internal		
				protected				protected		
				private				private		
	Event	name					name			Operation <<event>>
		modifiers	public				visibility	public		
			new				<<new>>			
			unsafe				<<unsafe>>			
		attribute sections					<<attributes>>			
		doc comments					Comment(->Documentation)			
		type					direction	return	Parameter	
		type dimensions					multiplicity			
		nullable					<<nullable>>			
		Add Accessor					<<AddRemoveAccessor>>			
		Remove Accessor								
	Type Parameter	name					name			Template Parameter
		constraint					constraining classifier			
		predefined constraint	struct				<<ValueTypeConstraint>>			
			class				<<ReferenceTypeConstraint>>			
			new()				<<ConstructorConstraint>>			
		attribute sections					<<attributes>>			
Delegate	name						name			Class <<delegate>>
	modifiers	internal					visibility	package		
		protected internal						protected <<internal>>		
		public						public		
		protected						protected		

C# ◁▷ UModel								
C#				**UModel**				
Delegate		private			private			Class <<delegate>>
		unsafe		<<unsafe>>				
		new		<<new>>				
	file name			code file name				
	associated project file/directory			ComponentRealization				
	attribute sections			<<attributes>>				
	doc comments			Comment(->Documentation)				
	type			direction	return	Parameter	Operation	
	Parameter	name		name				
		modifiers	ref	direction	inout			
			out		out			
			params	varArgList				
		type		type				
		type dimensions		multiplicity				
		type pointer		type modifier				
		nullable		<<nullable>>				
	Type Parameter	name		name			Template Parameter	
		constraint		constraining classifier				
		predefined constraint	struct	<<ValueTypeConstraint>>				
			class	<<ReferenceTypeConstraint>>				
			new()	<<ConstructorConstraint>>				
		attribute sections		<<attributes>>				
Enum	name			name				Enum-eration
	modifiers	internal		visibility	package			
		protected internal			protected <<internal>>			
		public			public			
		protected			protected			
		private			private			
		new		<<new>>				
	file name			code file name				
	associated project file/directory			ComponentRealization				
	base type			type	<<BaseType>>			
	attribute sections			<<attributes>>				
	doc comments			Comment(->Documentation)				
	Enum Constant	name		name		Enumerat-ion Literal		
		default value		default				
		attribute sections		<<attributes>>				
		doc comments		Comment(->Documentation)				
Parameterized Type				Anonymous Bound Element				

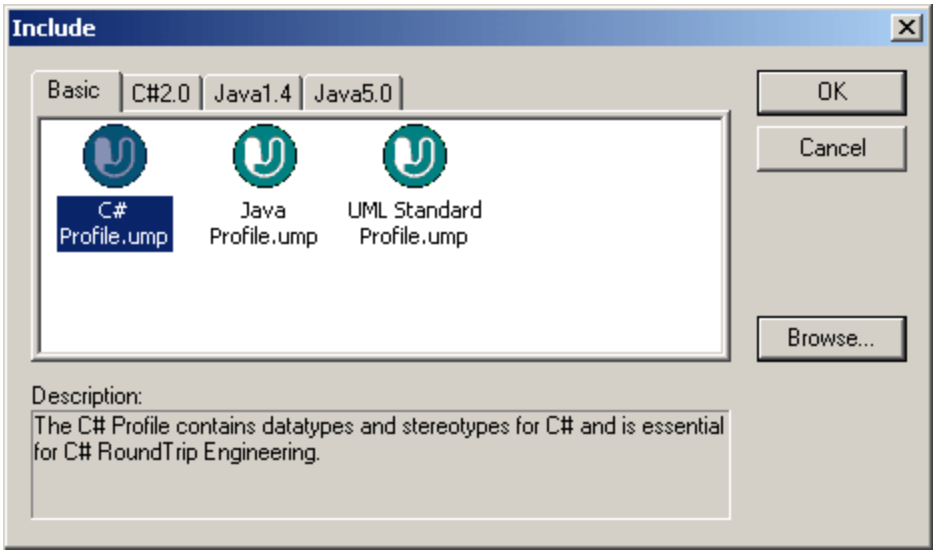
5.6 Including other UModel projects

UModel is supplied with several files that can be included in a UModel project. Clicking one of the Java tabs allows you to include Java lang classes, interfaces and packages in your project, by selecting one of the supplied files.

1. Select **Project | Include Subproject** to open the "Include" dialog box.
2. Click the UModel project file you want to include, and press OK.

UModel projects can be included within other UModel projects. To include projects place the respective *.ump files in:

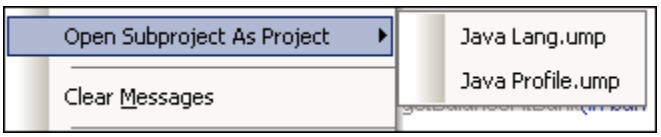
- ...\UModel2006**UModelInclude** to appear in the Basic tab, or
- ...\UModel2006**UModelInclude\Java1.4 / Java5.0** to appear in the Java tab.



Please note:
An include file, which contains all types of the Microsoft .NET Framework 2.0, is available in the C# 2.0 tab.

To view all currently imported projects:

- Select the menu option **Project | Open Subproject as project**.
  The flyout menu displays the currently included subprojects.



To create a user-defined tab/folder:

1. Navigate to the ...\UModel**2006\UModelInclude** and create/add your folder below ...\UModelInclude, i.e. ...**UModelInclude\myfolder.**

To create descriptive text for each UModel project file:

1. Create a text file using the same name as the *.ump file and place in the same folder. Eg. the **MyModel.ump** file requires a descriptive file called **MyModel.txt.** Please make

sure that the encoding of this text file is UTF-8.

To remove an included project:

1. Click the included package in the Model Tree view and press the Del. key.
2. You are prompted if you want to continue the deletion process.
3. Click OK to delete the included file from the project.

Please note:

- To delete or remove a project from the "Include" dialog box, delete or remove the (MyModel).ump file from the respective folder.

5.7 Sharing Packages and Diagrams

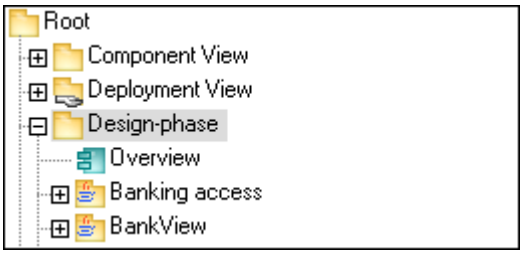
UModel allows you to share packages and UML diagrams they might contain, between different projects. Packages can be included in other UModel projects by reference, or as a copy.

Shared package prerequisites:

- Links to other packages outside of the shared scope are not permissible.

To share a package between projects:

1. Right click a package in the Model Tree tab and select **Subproject | Share package**.

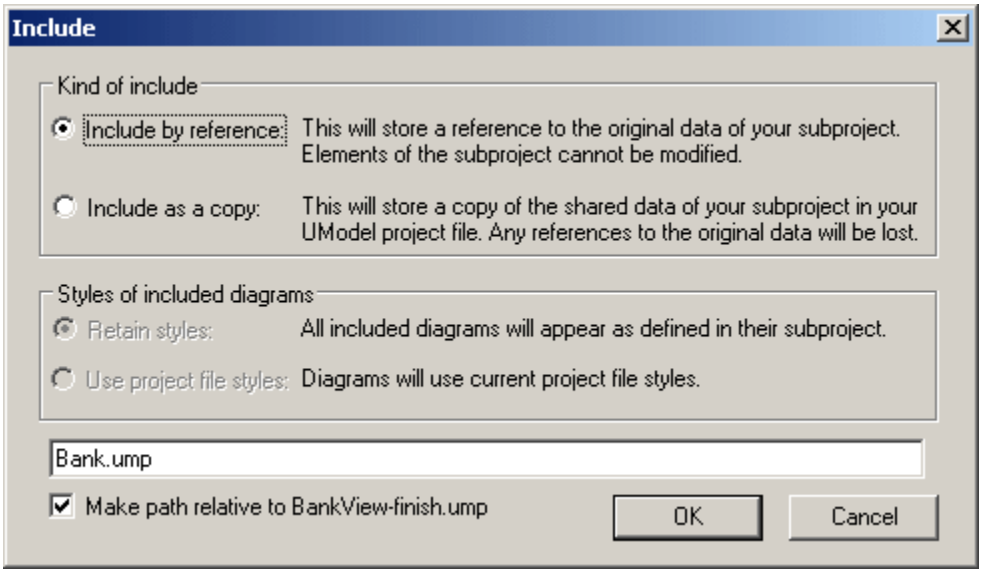


A "shared" icon appears below the shared package in the Model Tree. This package can now be included in any other UModel project.

To include/import a shared folder in a project:

1. Open the project which should contain the shared package (an empty project in this example).

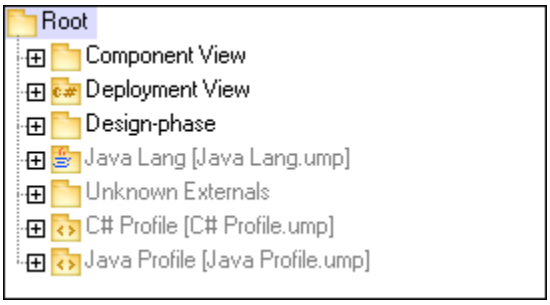
2. Select the menu item **Project | Include Subproject...**
3. Click the Browse button, select the project that contains the shared package and click Open.



The "Include" dialog box allows you to choose between including the package/project

by reference, or as a copy.

4. Select the specific option (Include by reference) and click OK.



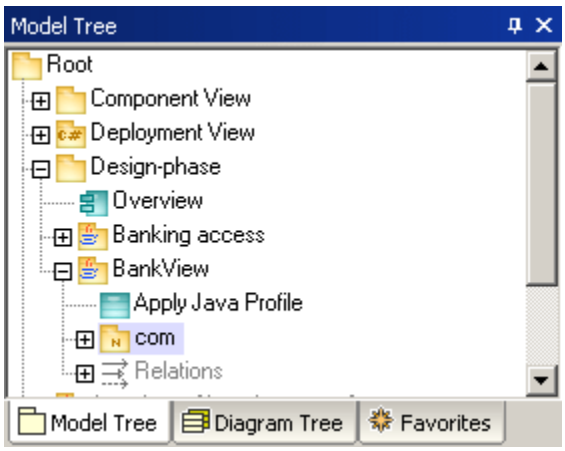
The "Deployment View" package is now visible in the new package. The packages' source project is displayed in parenthesis (BankView-start.ump).

Shared folders that have been included by reference can be changed to "Include by copy" at any time, by right clicking the folder and selecting **Subproject | Include as a Copy**.

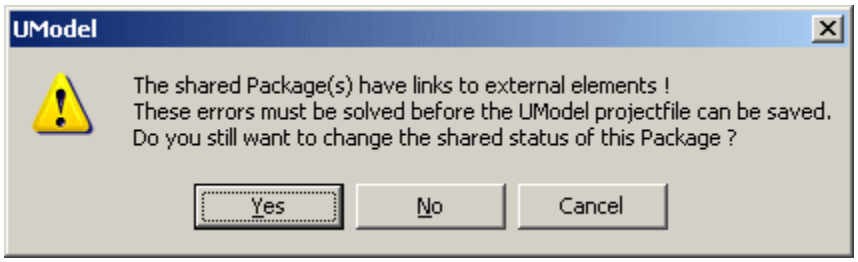
Please note:

All included projects of the source project, have also been included: Java Lang, Unknown Externals and Java Profile.

Shared packages - links to external elements:

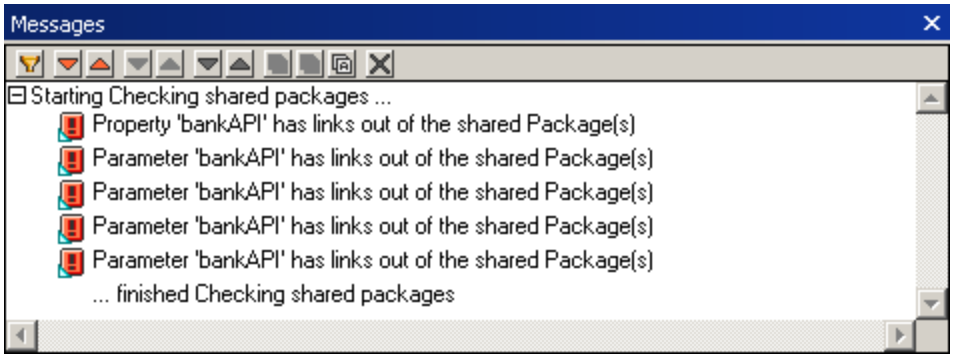


Attempting to share a package which has links to external elements causes a prompt to appear. E.g. trying to share the BankView package.

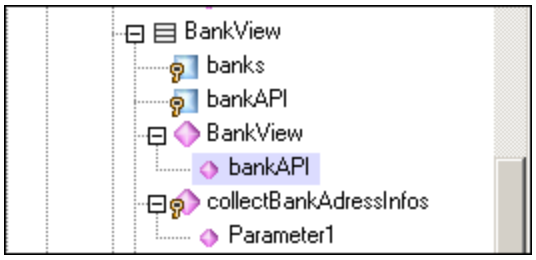


Clicking Yes, forces you to resolve the external links before you can save.

The Messages pane provides information on each of the external links.



Clicking an error entry, in the Messages pane, displays the relevant element in the Model Tree tab.

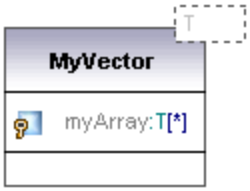


5.8 UML templates

UModel now supports the use of UML templates and their mapping to/from Java 5.0 and C# generics.

- Templates are "potential" model elements with unbound formal parameters.
- These parameterized model elements, describe a group of model elements of a particular type: classifiers, or operations.
- Templates cannot be used directly as types, the parameters have to be bound.
- Instantiate means binding the template parameters to actual values.
- Actual values for parameters are expressions.
- The binding between a template and model element, produces a new model element (a bound element) based on the template.
- If multiple constraining classifiers exist in C#, then the template parameters can be directly edited in the Properties tab, when the template parameter is selected.

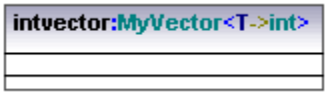
Template **signature** display in UModel:



- Class template called **MyVector**, with formal template parameter "**T**", visible in the dashed rectangle.
- Formal parameters without type info (T) are implicitly classifiers: Class, Datatype, Enumeration, PrimitiveType, Interface. All other parameter types must be shown explicitly e.g. Integer.
- Property **myArray** with unbounded number of elements of type T.

  Right clicking the template and selecting **Show | Bound elements**, displays the actual bound elements.

Template **binding** display:



- A bound named template **intvector**
- Template of type, **MyVector**, where
- Parameter **T** is substituted/replaced by **int.**
- **"Substituted by"** is shown by **- >**.

Template use in properties/operations:

An anonymous template binding:

- Property MyFloatVector of type **MyVector<T->float>**

Templates can also be defined when defining properties or operations. The autocomplete function helps you with the correct syntax when doing this.

- Operation1 returns a vector of floats.

5.8.1 Template signatures

A Template signature is a string that specifies the formal template parameters. A template is a parameterized element that is used to generate new model elements by substituting/binding the formal parameters to actual parameters (values).

Formal template parameter

T
Template with a single untyped formal parameter
(stores elements of type T)

Multiple formal template parameters

KeyType:DateType, ValueType

Parameter substitution

T>aBaseClass

The parameter subsitution must be of type "aBaseClass", or derived from it.

Default values for template parameters

T=aDefaultValue

Substituting classifiers

T>{contract}aBaseClass

allowsSubstitutable is true
Parameter must be a classifier that may be substituted for the classifier designated by the classifier name.

Constraining template parameters

T:Interface>anInterface

When constraining to anything other than a class, (interface, datatype), the constraint is displayed after the colon ":" character. E.g. T is constrained to an interface (T:Interface) which must be of type "anInterface" (>anInterface).

Using wildcards in template signatures

T>vector<T->?<aBaseClass>

Template parameter T must be of type "vector" which contains objects which are a supertype of aBaseClass.

Extending template parameters

T>Comparable<T->T>

5.8.2 Template binding

Template binding involves the substitution of the formal parameters by actual values, i.e. the template is instantiated. UModel automatically generates anonymously bound classes, when this binding occurs. Bindings can be defined in the class name field as shown below.

Substituting/binding formal parameters

vector <T->int>

Create bindings using the class name

a_float_vector:vector<T->float>

Binding multiple templates simultaneously

Class5:vector<T->int, map<KeyType->int, ValueType<T->int>

Using wildcards ? as parameters (Java 5.0)

vector<T->?>

Constraining wildcards - upper bounds (UModel extension)

vector<T->?>aBaseClass>

Constraining wildcards - lower bounds (UModel extension)

vector<T->?<aDerivedClass>

5.8.3 Template usage in operations and properties

Operation returning a bound template

Class1
Operation1():vector<T->int>

Parameter T is bound to "int". Operation1 returns a vector of ints.

Class containing a template operation

Class1
Operation1<T>(in T):T

Using wildcards

Class1
Property1:vector<T->?>

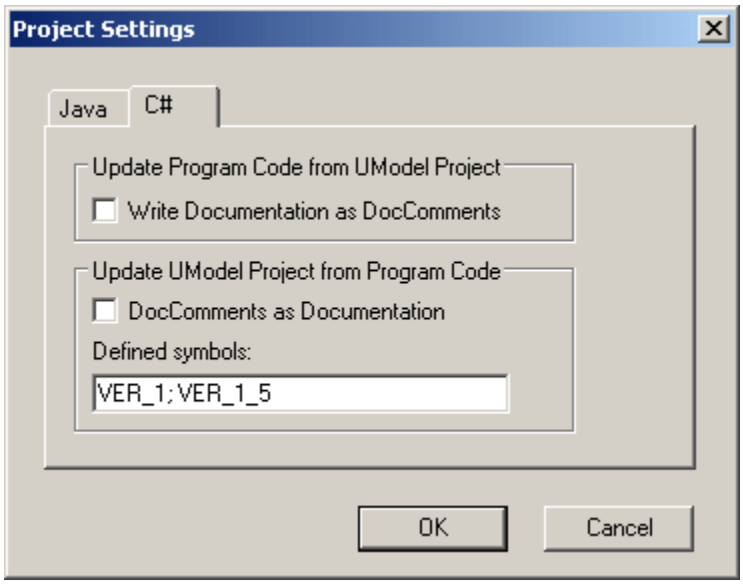
This class contains a generic vector of unspecified type (? is the wildcard).

Typed properties can be displayed as associations:

- Right click a property and select **Show | PropertyX as Association**, or
- Drag a property onto the diagram background.

5.9 Project Settings

This option allows you to define the global project settings.



Select the menu item **Tools | Options** to define your local settings, please see **Tools | Options** in the Reference section for more details on the local settings.

Chapter 6

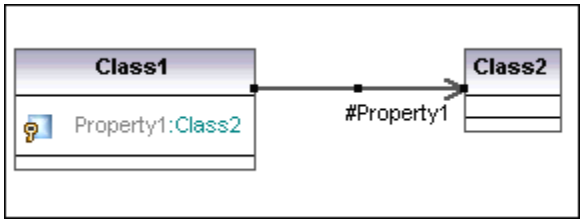
Creating model relationships

6 Creating model relationships

Model relationships can be created and inserted into diagrams using several methods:

- By clicking the aggregation  , or composition  icons in the icon bar.
- By using the connection handles, please see Use cases for an example.
- By clicking the association icon  in the icon bar, and creating a connection between elements using drag and drop

When an association has been created, a new attribute is automatically inserted in the originating (A:name) class, e.g. Property1:Class2, in the example below.



Having created the association it is shown as active, and the Properties tab displays its properties.

Clicking an association line, displays the association properties in the Properties tab. A:Name and B:Name indicate the role of each class in the other.

Depending on the "memberEndKind" - **property** (of A:name "Property1"):
the **attribute** either belongs to:

- the **class** - i.e. **A**:memberEndKind = **memberEnd**, (attribute is visible in class1), or
- the **association** - i.e. **B**:memberEndKind = **ownedEnd** (attribute not visible in class2).

  If both attributes belongs to the **association**, i.e. both ends are defined as "ownedEnd, then this association becomes bi-directional, and the navigability arrow disappears. Both ends of the association are "ownedEnd".

If the memberEndKind of any of the association is set to "**navigableOwnedEnd**, then the

attribute is still part of the association, but the navigability arrow reappears depending on which end (A:name or B:Name) it is set.

To define the type of association (association, aggregate, or composite)

1. Click the association arrow.
2. Scroll down to the **aggregation** item in the Properties tab.
3. Select: none, shared or composite.

None: a standard association
shared: an **aggregate** association
composite: a **composite** association.

Please note:

Associations can be created using the same class as both the source and target. This is a so-called self link. It describes the ability of an object to send a message to itself, for recursive calls.

Click the relationship icon, then drag from the element, dropping somewhere else on the same element. A self-link appears.

Displaying associations in Diagrams automatically

When inserting diagram elements in a diagram, the "Automatically create Associations" option in the **Tools | Options | Editing** tab, allows existing associations between modeling elements to be automatically created/displayed in the current diagram. This occurs if the attributes type is set, and the referenced "type" modeling element is in the current diagram.

Deleting relationships/associations:

1. Click the relationship in the diagram tab, or in the Model Tree.
2. Press the **Del.** keyboard key.
   The dependency is deleted from the diagram and project.

Deleting class associations:

Deleting a **class** association does not delete the **attribute/property** that was automatically generated, from the class!

1. Right click the attribute/property in the class.
2. Select the option "**Delete PropertyX**" from "ClassX" to delete it.

6.1 Associations, realizations and dependencies

Creating relationships using connection handles:

1. Given two classes in the class diagram,
2. Click the first class to make it the active class.
   Connection handles appear on three sides.
3. Move the mouse pointer over the handle on the right border of the class.
   A Tooltip appears, informing you of the type of relationship that this handle creates, Association in this case.
4. Drag to create a connector, and drop it on the second class. The target class is highlighted if this type of association is possible.
   An association has now been created between these two classes.

Elements in the various model diagrams supply you with different connection handles. E.g. a class in a class diagram supplies the following relationship handles (in clockwise fashion):

- InterfaceRealization
- Generalization
- Association

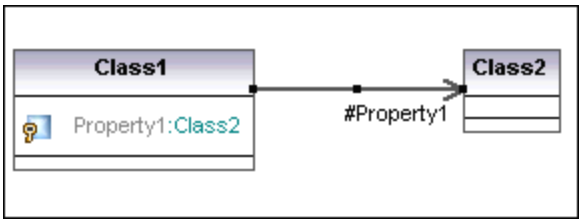
An Artifact in the Deployment view supplies the following handles:

- Manifestation
- Association
- Deployment

Creating relationships using icons in the icon bar:
Given two elements in a modeling diagram,

1. Click the icon that represents the relationship you want to create e.g. association, aggregation, or composition.
2. Drag from the one object to the other, and drop when the target element is highlighted.

   When creating a new association, a new attribute is automatically inserted in the originating (A:name) class, Property1:Class2, in the example below.



   UModel always shows all attributes of a class!

   Please note:
   The screenshots in this manual do not show the Association **Ownership dot**.

   To enable it, set the **Show Assoc. Ownership**, in the Styles tab, to true.

Deleting relationships/associations:

1. Click the relationship in the diagram tab, or in the Model Tree.

2. Press the **Del.** keyboard key.
   The dependency is deleted from the diagram and project.

Deleting class associations:

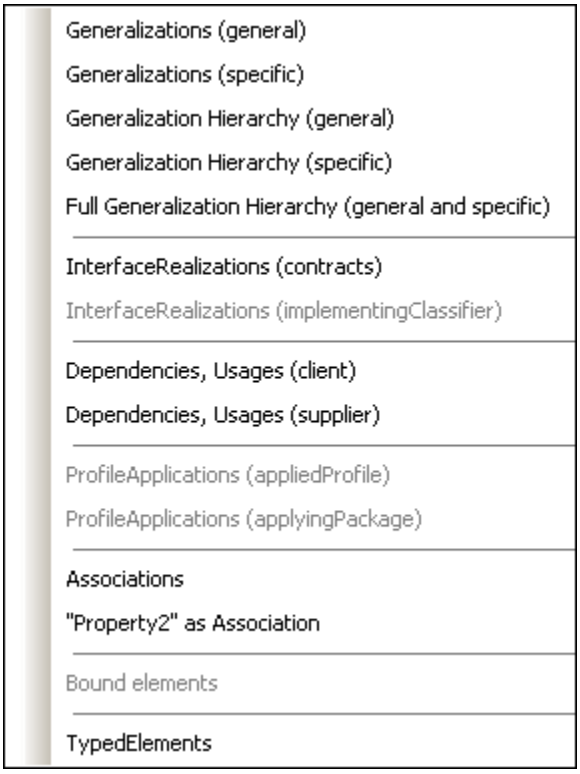
Deleting a **class** association does not delete the **attribute/property** that was automatically generated, from the class!

1. Right click the attribute/property in the class.
2. Select the option "**Delete PropertyX**" from "ClassX" to delete it.

6.2 Showing model relationships

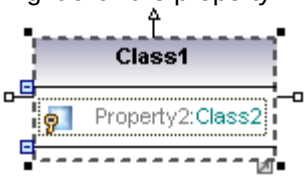
Showing relationships between modeling elements:

1. Right click the specific element and select **Show**.
   The popup menu shown below is context specific, meaning that only those options are available that are relevant to the specific element.

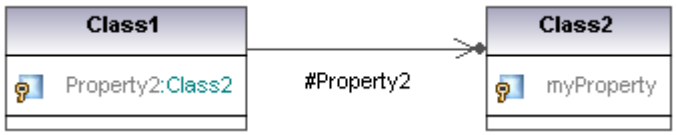


To show a class attribute/property as an association:

1. Right click the property in the class.



2. Select the menu option **Show | "PropertyXX" as Association**.
   This inserts/opens the referenced class and shows the relevant association.



Chapter 7

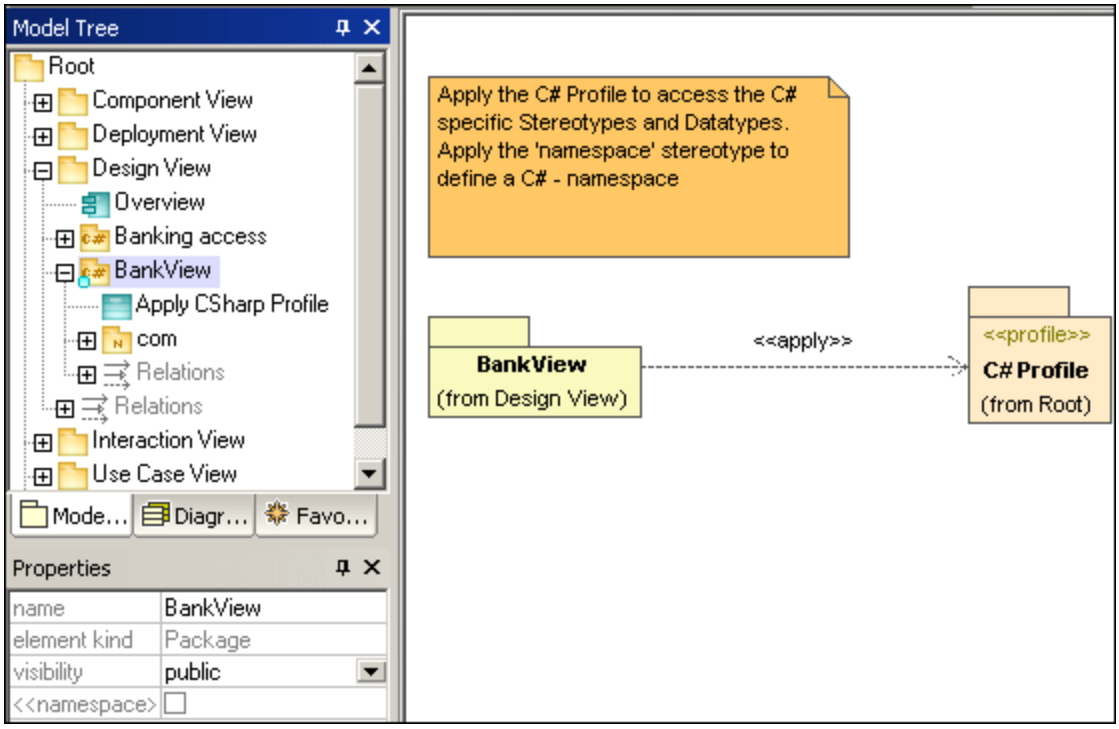
Profiles and stereotypes

7 Profiles and stereotypes

The Profiles package is used to extend the UML meta model. The primary extension construct is the Stereotype, which is itself part of the profile. Profiles must always be related to a reference meta model such as UML, they cannot exist on their own.

The Java Profile.ump (or C# Profile.ump) file needs to be applied when creating new UModel projects using the menu item **Project | Include Subproject.** This profile supplies the Java datatypes and stereotypes, and is essential when creating code for round-trip engineering.

The **Bank_CSharp.ump** sample file (in the UModelExamples folder) shows how this is done. The C# profile has been applied to the BankView package.



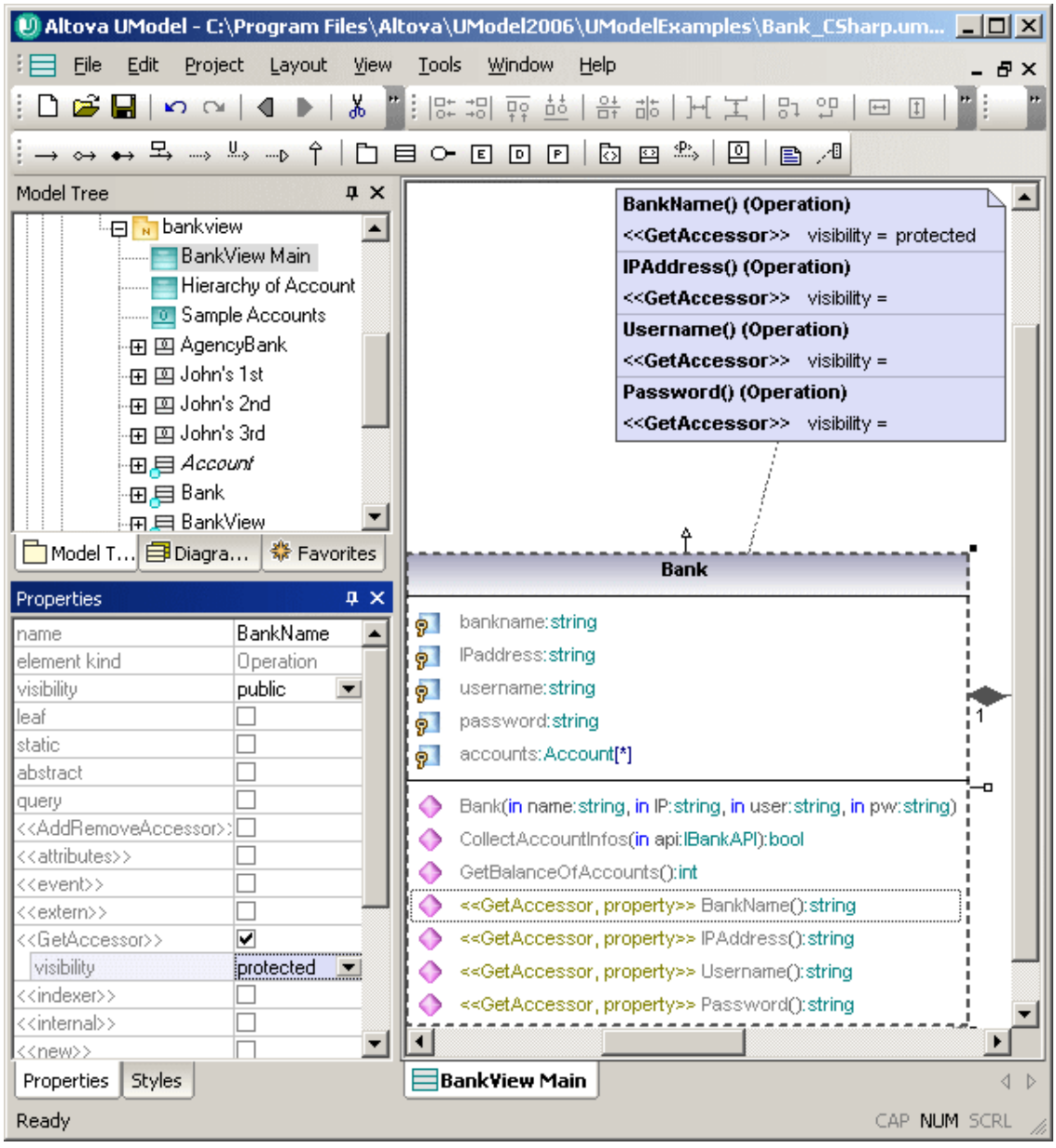
- Profiles are specific types of packages, that are applied to other packages.
- Stereotypes are specific metaclasses, that extend standard classes.
- "Tagged values" are values of stereotype attributes.

A Profile Application shows which profiles have been applied to a package, and is a type of package import that states that a Profile is applied to a Package. The Profile extends the package it has been applied to. Applying a profile, using the ProfileApplication icon  , means that all stereotypes that are part of it, are also available to the package.

Profile names are shown as dashed arrows from the package **to** the applied profile, along with the <<apply>> keyword.

Stereotypes:
A stereotype defines how an existing metaclass may be extended. It is a kind of class that extends Classes through Extensions. Stereotypes can only be created in Profiles. Stereotypes are displayed as classes, in class diagrams, with the addition of the keyword <<stereotype>> added above the name of the class.

- Stereotypes may have **properties**, which are called "**tag definitions**"
- When the stereotype is applied to a model element, the property **values** are called "**tagged values**"
- When stereotypes containing properties are applied, the tagged values are automatically displayed in a comment element (shown below)
- If the attribute is of type "enumeration", then an popup menu allows you to select from the predefined values. You can also enter/select the specific value in the Properties tab e.g. <<GetAccessor>> visibility = public, protected etc.

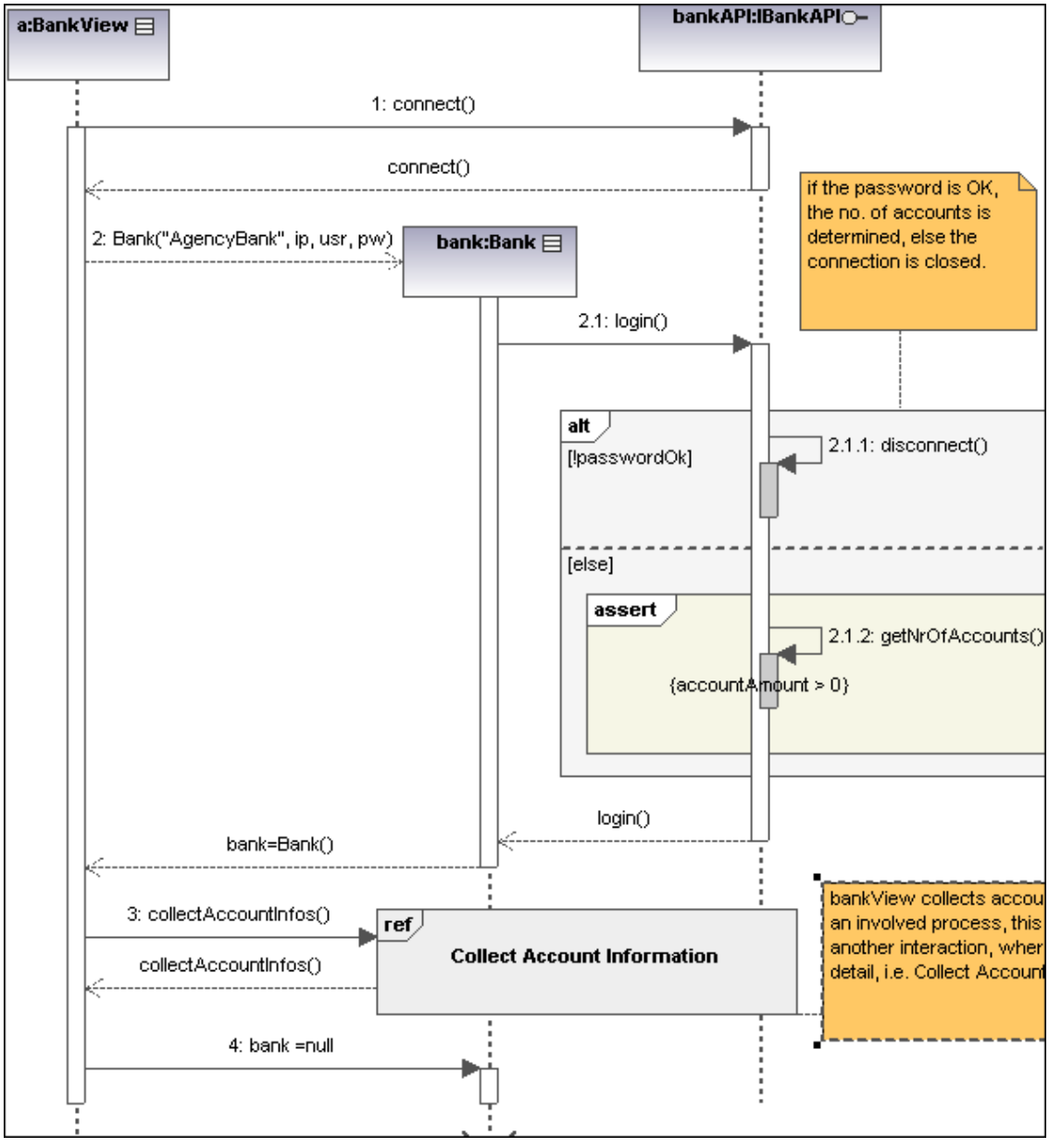


Chapter 8

Sequence Diagram

8 Sequence Diagram

UModel supports the standard Sequence diagram defined by UML, and allows easy manipulation of objects and messages to model use case scenarios. Please note that the sequence diagrams shown in the following sections are only available in the **Bank_Java**.ump, **Bank_CSharp**.ump and **Bank_MultiLanguage**.ump samples, in the ...\UModelExamples folder supplied with UModel.

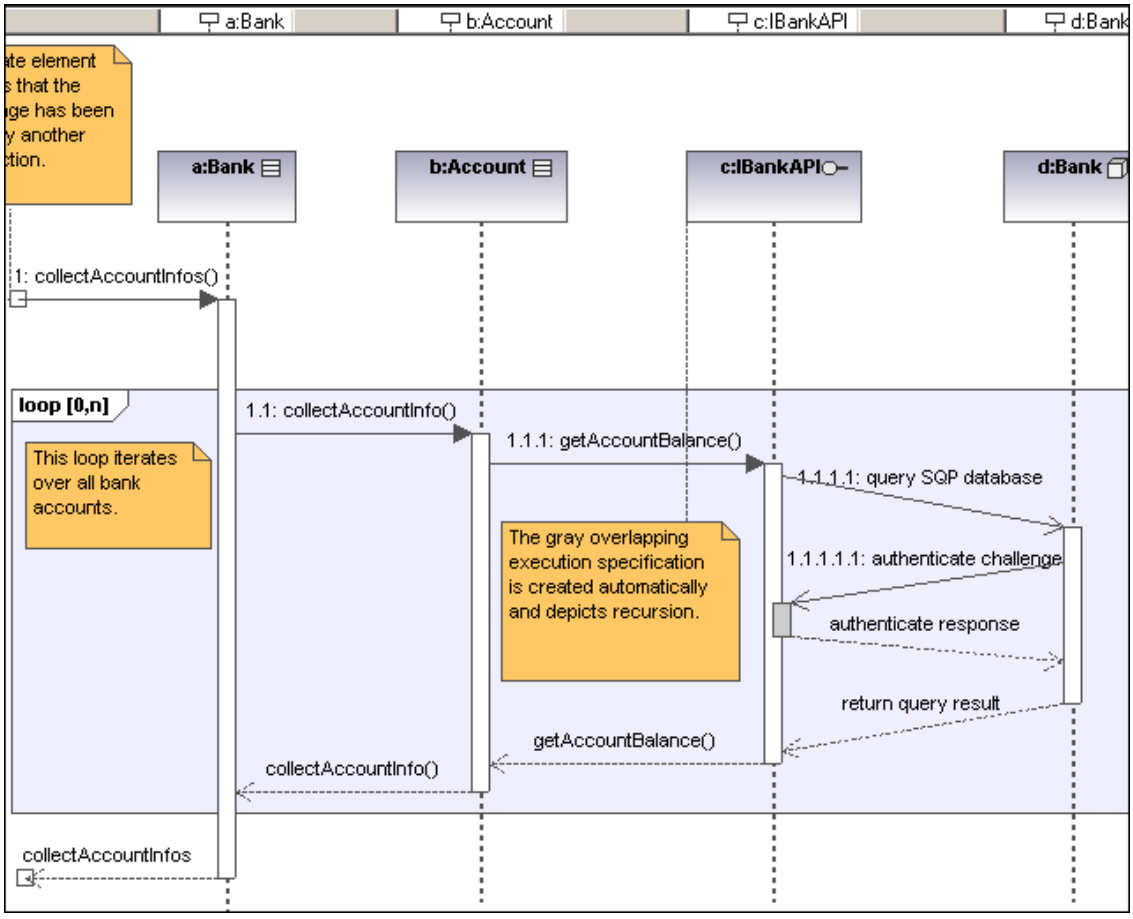


8.1 Inserting sequence diagram elements

A sequence diagram models runtime dynamic object interactions, using messages. Sequence diagrams are generally used to explain individual use case scenarios.

- **Lifelines** are the horizontally aligned boxes at the top of the diagram, together with a dashed vertical line representing the object's life during the interaction. Messages are shown as arrows between the lifelines of two or more objects.
- **Messages** are sent between sender and receiver objects, and are shown as labeled arrows. Messages can have a sequence number and various other optional attributes: argument list etc. Conditional, optional, and alternative messages are all supported. Please see Combined Fragment for more information.

Sequence diagram and other UModel elements, can be inserted into a sequence diagram using several methods.



Using the toolbar icons:

1. Click the specific sequence diagram icon in the Sequence Diagram toolbar.
2. Click in the Sequence diagram to insert the element.
   Note that holding down CTRL and clicking in the diagram tab, allows you to insert multiple elements of the type you selected.

Dragging existing elements into the sequence diagram:

Most classifier types, as well as elements occurring in other sequence diagrams, can be

inserted into an existing sequence diagram.

1. Locate the element you want to insert in the Model Tree tab (you can use the search function text box, or press CTRL+F, to search for any element).
2. Drag the element(s) into the sequence diagram.

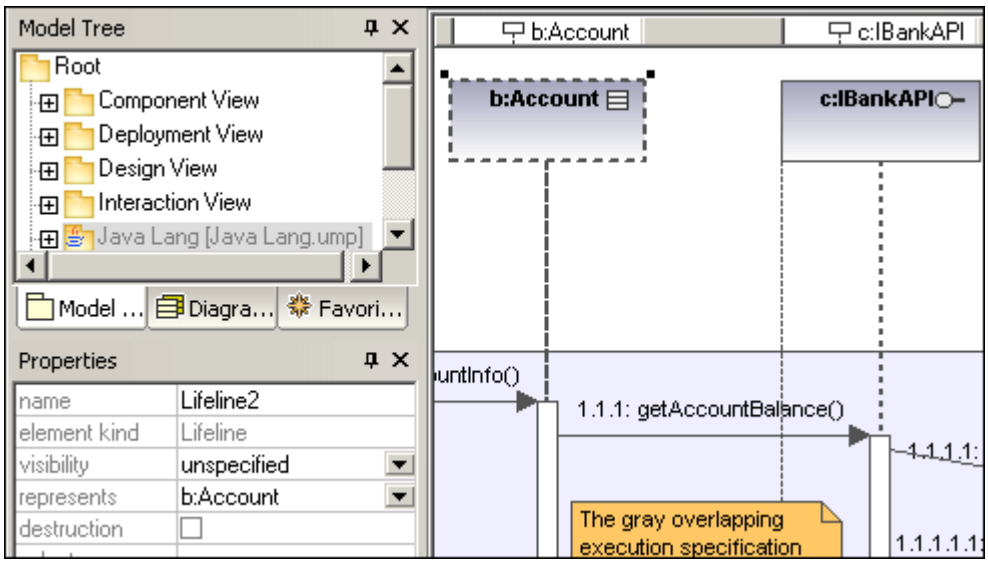
8.1.1 Lifeline

Lifeline

The lifeline element is an individual participant in an interaction. UModel also allows you to insert other elements into the sequence diagram, e.g. classes and actors. Each of these elements appear as a new lifeline once they have been dragged into the diagram pane from the Model Tree tab.

The lifeline label appears in a bar at the top of the sequence diagram. Labels can be repositioned and resized in the bar, with changes taking immediate effect in the diagram tab. You can also redefine the label colors/gradient using the "Header Gradient" combo boxes in the Styles tab.

Most classifier types can be inserted into the sequence diagram. The "represents" field in the Properties tab displays the element type that is acting as the lifeline.



Execution Specification (Object activation):
An execution specification (activation) is displayed as a box (rectangle) on the object lifeline. An activation is the execution of a procedure and the time needed for any nested procedures to execute. Activation boxes are automatically created when a message is created between two lifelines.

A recursive, or self message (one that calls a different method in the same class) creates stacked activation boxes.

Displaying/hiding activation boxes:

1. Click the **Styles** tab and scroll to the bottom of the list.
   The "**Show Execution Specifications**" combo box allows you to show/hide the activation boxes in the sequence diagram.

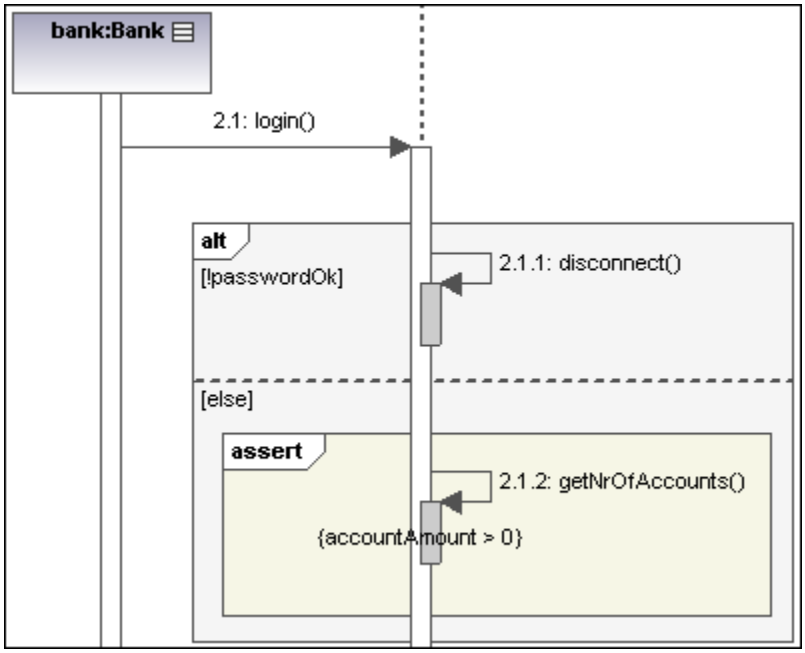
Lifeline attributes:
The **destruction** check box allows you to add a destruction marker, or stop, to the lifeline without having to use a destruction message.

The **selector** field allows you to enter an expression that specifies the particular part represented by the lifeline, if the ConnectableElement is multivalued, i.e. has a multiplicity greater than one.

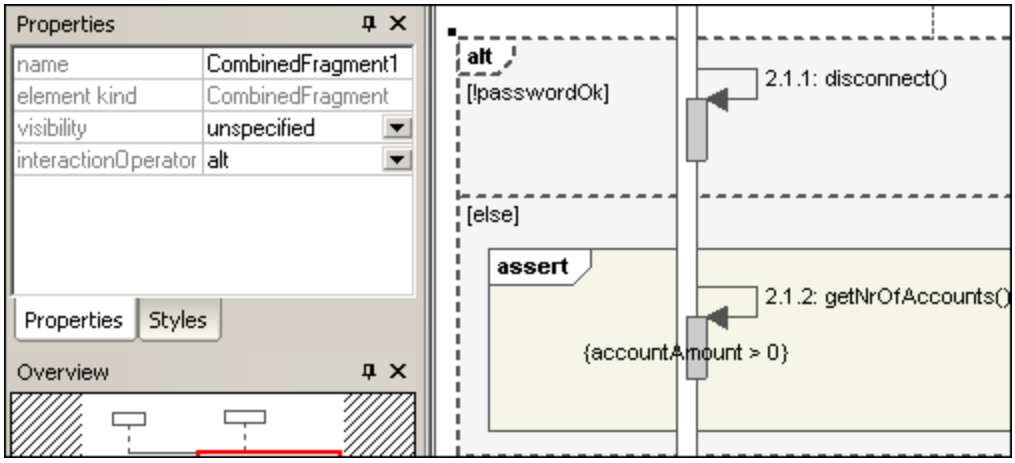
8.1.2 Combined Fragment

Combined Fragment

Combined fragments are subunits, or sections of an interaction. The **interaction operator** visible in the pentagon at top left, defines the specific kind of combined fragment. The constraint thus defines the specific fragment, e.g. loop fragment, alternative fragment etc. used in the interaction.

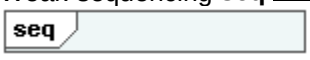


The combined fragment icons in the icon bar, allow you to insert a specific combined fragment: seq, alt or loop. Clicking the **interactionOperator** combo box, also allows you to define the specific interaction fragment.



Interaction Operators

Weak sequencing **seq** 



The combined fragment represents weak sequencing between the behaviours of the operands.

Alternatives **alt** 
Only one of the defined operands will be chosen, the operand must have a guard expression that evaluates to true. If one of the operands uses the guard "else", then this operand is executed if all other guards return false. The guard expression can be entered immediately upon insertion, will appear between the two square brackets.

Option **opt**
Option represents a choice where either the sole operand is executed, or nothing happens.

Break **break**
The break operator is chosen when the guard is true, the rest of the enclosing fragment is ignored.

Parallel **par**
Indicates that the combined fragment represents a parallel merge of operands.

Strict sequencing **strict**
The combined fragment represents a strict sequencing between the behaviours of the operands.

Loop **loop** 
The loop operand will be repeated by the number of times defined in the guard expression.

Having selected this operand, you can directly edit the expression (in the loop pentagon) by double clicking.

Critical Region **critical**
The combined fragment represents a critical region. The sequence(s) may not be interrupted/ interleaved by any other processes.

Negative **neg**
Defines that the fragment is invalid, and all others are considered to be valid.

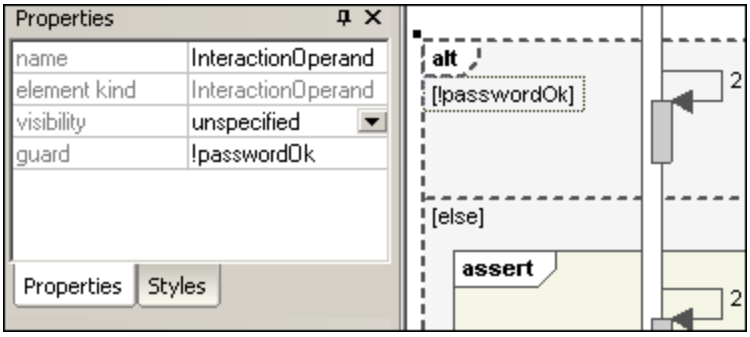
Assert **assert**
Designates the valid combined fragment, and its sequences. Often used in combination with consider, or ignore operands.

Ignore **ignore**
Defines which messages should be ignored in the interaction. Often used in combination with assert, or consider operands.

Consider **consider**
Defines which messages should be considered in the interaction.

Adding Interaction Operands to a combined fragment:

1. Right click the combined fragment and select **New | InteractionOperand**.
   The text cursor is automatically set for you to enter the guard condition.
2. Enter the guard condition e.g. !passwordOK and press Enter to confirm.



3. Use the same method to add the second interaction operand with the guard condition "else".
   Dashed lines separate the individual operands in the fragment.

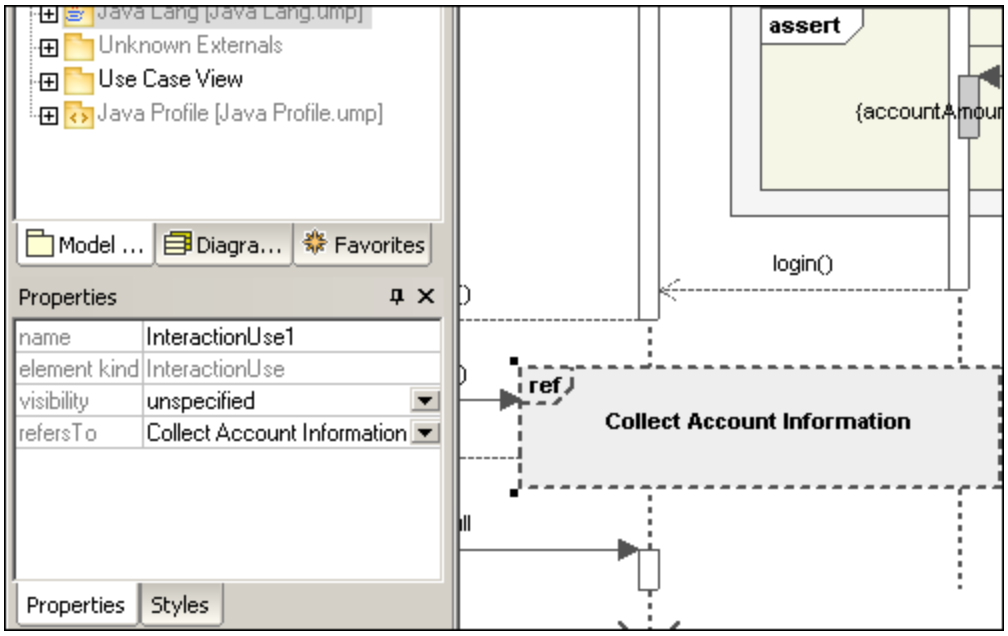
Deleting Interaction Operands:

1. Double click the guard expression in the combined fragment element, of the diagram (not in the Properties tab).
2. Delete the guard expression completely, and press Enter to confirm.
   The guard expression/interaction operand is removed and the combined fragment is automatically resized.

8.1.3 Interaction Use

Interaction use

The Interaction Use element is a reference to an interaction element. This element allows you to share portions of an interaction between several other interactions.



Clicking the "refersTo" combo box, allows you to select the interaction that you want to refer to. The name of the interaction use you select, appears in the element.

Please note:

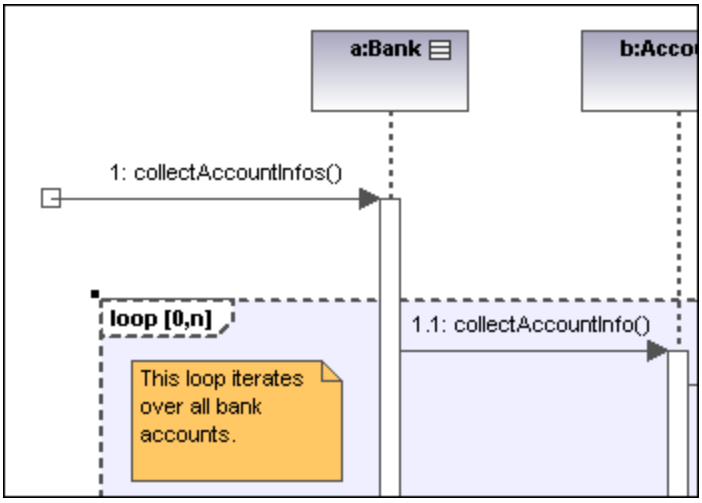
You can also drag an existing Interaction Use element from the Model Tree into the diagram tab.

8.1.4 Gate

Gate

A gate is a connection point which allows messages to be transmitted into, and out of, interaction fragments. Gates are connected using messages.

1. Insert the gate element into the diagram.
2. Create a new message and drag from the gate to a lifeline, or drag from a lifeline and drop onto a gate.
   This connects the two elements. The square representing the gate is now smaller.



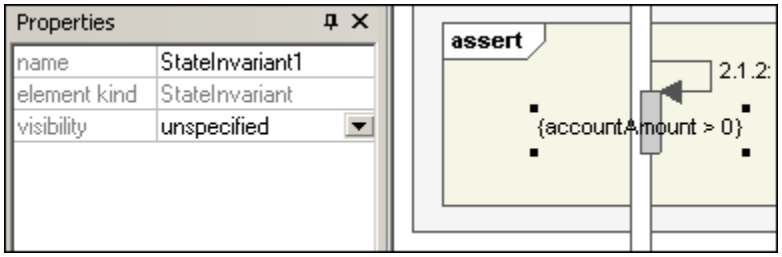
8.1.5 State Invariant

State invariant

A state invariant is a condition, or constraint applied to a lifeline. The condition must be fulfilled for the lifeline to exist.

To define a state invariant:

1. Click the State invariant icon, then click a lifeline, or an object activation to insert it.
2. Enter the condition/constraint you want to apply, e.g. accountAmount > 0, and press Enter to confirm.



8.1.6 Messages

Messages are sent between sender and receiver lifelines, and are shown as labeled arrows. Messages can have a sequence number and various other optional attributes: argument list etc. Messages are displayed from top to bottom, i.e. the vertical axis is the time component of the sequence diagram.

- A **call** is a synchronous, or asynchronous communication which invokes an operation that allows control to return to the sender object. A call arrow points to the **top** of the activation that the call initiates.
- Recursion, or calls to another operation of the same object, are shown by the stacking of activation boxes (Execution Specifications).

To insert a message:

1. Click the specific message icon in the Sequence Diagram toolbar.
2. Click the lifeline, or activation box of the sender object.
3. Drag and drop the message line onto the receiver objects lifeline or activation box. Object lifelines are highlighted when the message can be dropped.

- The direction in which you drag the arrow defines the message direction. Reply messages can point in either direction.
- Activation box(es) are automatically created, or adjusted in size, on the sender/receiver objects. You can also manually size them by dragging the sizing handles.
- Depending on the message numbering settings you have enabled, the numbering sequence is updated.
- Having clicked a message icon and holding down CTRL, allows you to insert multiple messages by repeatedly clicking and dragging in the diagram tab.

To delete a message:

1. Click the specific message to select it.
2. Press the Del. key to delete it from the model, or right click it and select "Delete from diagram".
   The message numbering and activation boxes of the remaining objects are updated.

To position dependent messages:

1. Click the respective message and drag vertically to reposition it.
   The default action when repositioning messages, is it to move all dependent messages related to the active one.

   Using CTRL+ click, allows you to select multiple messages.

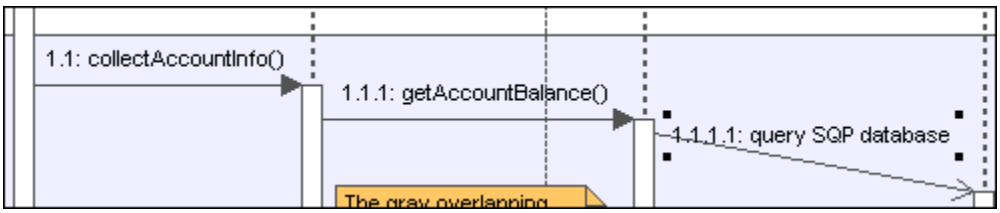
To position messages individually:

1. Click the "**Toggle dependent message movement**" icon  to deselect it.
2. Click the message you want to move and drag to move it.
   Only the selected message moves during dragging. You can position the message anywhere in the vertical axis between the object lifelines.

Message numbering:
UModel supports different methods of message numbering: nested, simple and none.

- **None**  removes all message numbering.
- **Simple**  assigns a numerical sequence to all messages from top to bottom i.e. in the order that they occur on the time axis.

- **Nested**  uses the decimal notation, which makes it easy to see the hierarchical structure of the messages in the diagram. The sequence is a dot-separated list of sequence numbers followed by a colon and the message name.



To select the message numbering scheme:
There are two methods of selecting the numbering scheme:

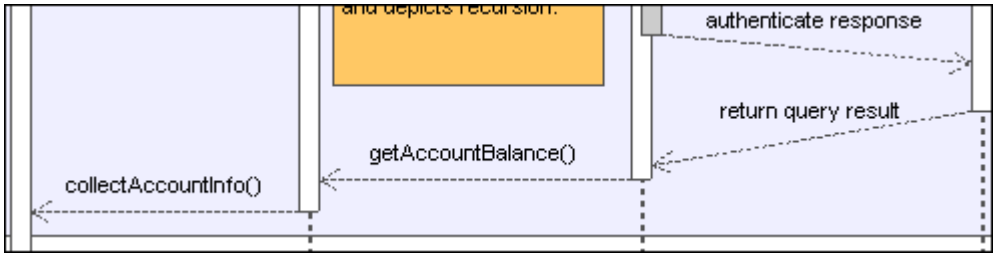
- Click the respective icon in the icon bar.
- Use the Styles tab to select the scheme.

To select the numbering scheme using the Styles tab:

1. Click the Styles tab and scroll down to the **Message Numbering** field.
2. Click the combo box and select the numbering option you want to use.
   The numbering option you select is immediately displayed in the sequence diagram.

Please note:
The numbering scheme might not always correctly number all messages, if ambiguous traces exist. If this happens, adding return messages will probably clear up any inconsistencies.

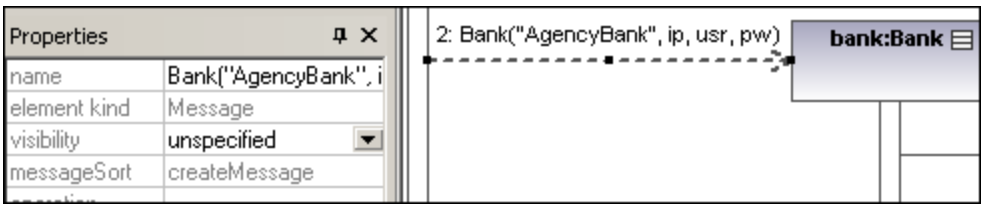
Message replies:
Message reply icons are available to create reply messages, and are displayed as dashed arrows.



Reply messages are also generally implied by the bottom of the activation box when activation boxes are present. If activation boxes have been disabled (Styles tab | Show Execution Specifics=false), then reply arrows should be used for clarity.

Creating objects with messages:

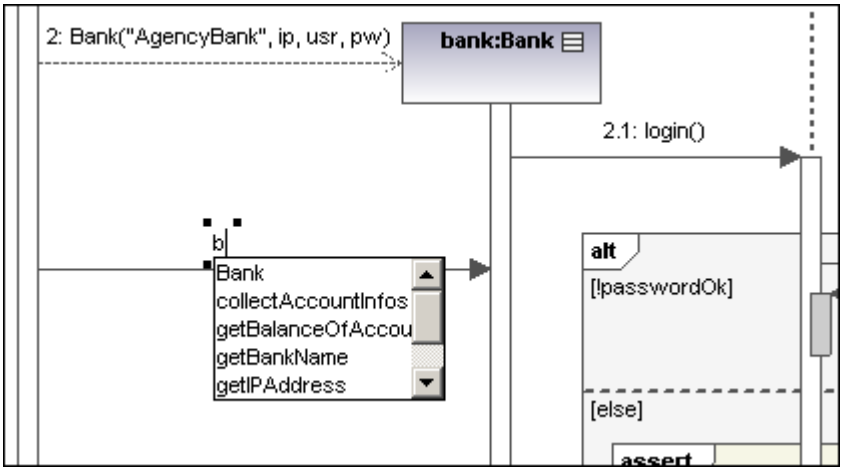
1. Messages can create new objects. This is achieved using the Message Creation icon  .
2. Drag the message arrow to the lifeline of an existing object to create that object.
   This type of message ends in the middle of an object rectangle, and often repositions the object box vertically.



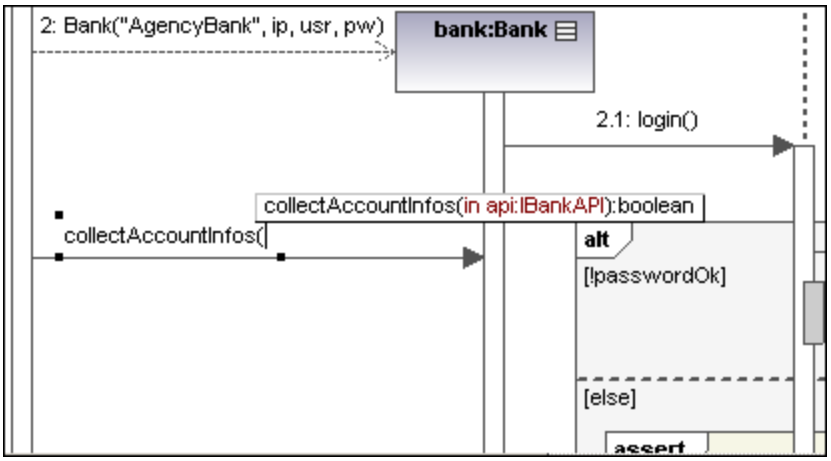
Sending messages to specific class methods/operations in sequence diagrams

Having inserted a class from the Model Tree into a sequence diagram, you can then create a message from a lifeline to a specific method of the receiver class (lifeline) using UModel's syntax help and autocompletion functions.

1. Create a message between two lifelines, the receiving object being a class lifeline (Bank)
   As soon as you drop the message arrow, the message name is automatically highlighted.
2. Enter a character using the keyboard e.g. "b".
   A pop-up window containing a list of the existing class methods is opened.



3. Select an operation from the list, and press Enter to confirm e.g. collectAccountInfos.
4. Press the spacebar and press Enter to select the parenthesis character that is automatically supplied.
   A syntax helper popup now appears, allowing you to enter the parameter correctly.



Message icons:

 Message (Call)

 Message (Reply)

 Message (Creation)

 Message (Destruction)

 Asynchronous Message (Call)

 Asynchronous Message (Reply)

 Asynchronous Message (Destruction)

 Toggle dependent message movement

Chapter 9

State Machine Diagram

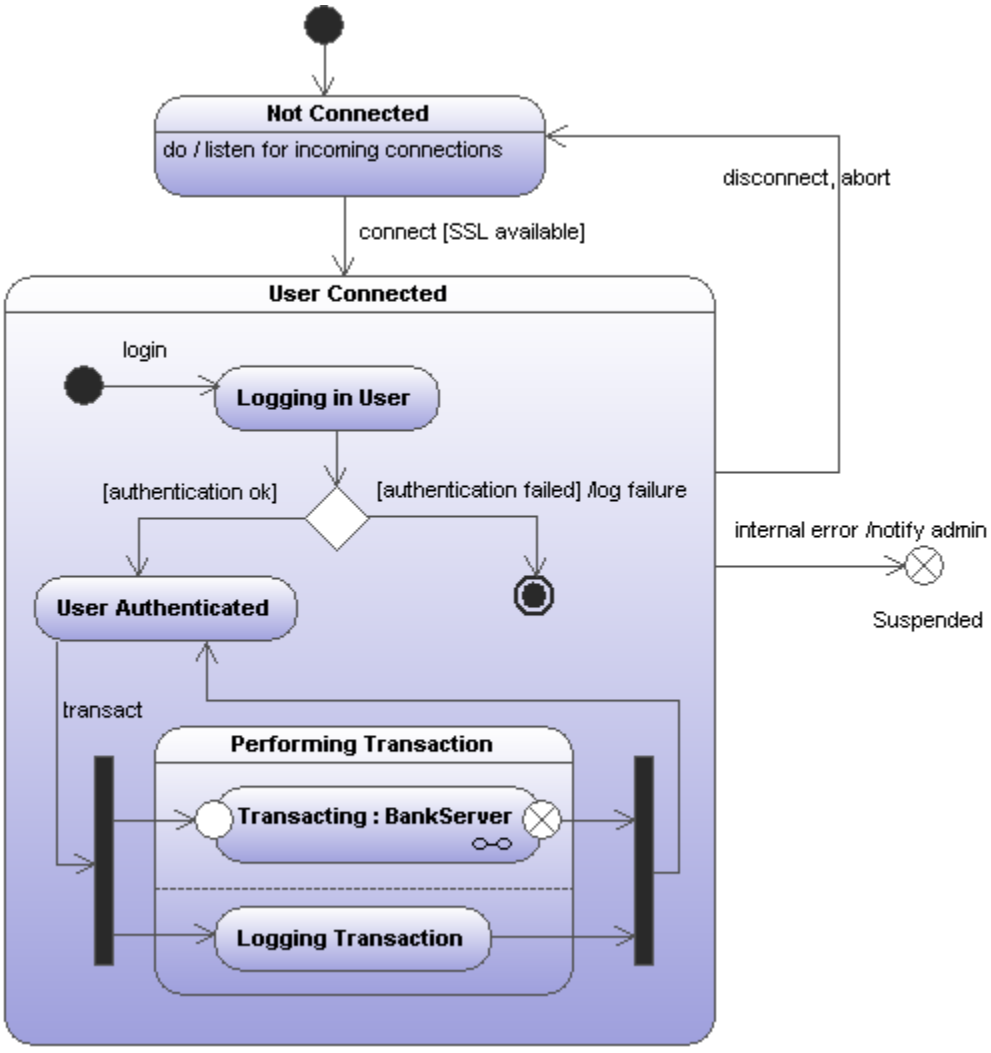
9 State Machine Diagram

The State Machine Diagram models the behavior of a system by describing the various states an object may be in, and the transitions between those states. They are generally used to describe the behavior of an object spanning several use cases. A state machine can have any number of State Machine Diagrams (or State Diagrams) UModel.

Two types of processes can achieve this:
Actions, which are associated to **transitions,** are short-term processes that cannot be interrupted. E.g. an initial transition, **internal error /notify admin**.

State **Activities** (behaviors), which are associated to **states,** are longer-term processes that may be interrupted by other events. E.g. **listen for incoming connections**.

Please note that the State machine diagrams shown in the following section are available in the **Bank_MultiLanguage**.ump sample, in the ...\UModelExamples folder supplied with UModel.



9.1 Inserting state machine diagram elements

Using the toolbar icons:

1. Click the specific state machine diagram icon in the State Machine Diagram toolbar.

2. Click in the State Diagram to insert the element.
   Note that holding down CTRL and clicking in the diagram tab, allows you to insert multiple elements of the type you selected.

Dragging existing elements into the state machine diagram:

Most elements occurring in other state machine diagrams, can be inserted into an existing state machine.

1. Locate the element you want to insert in the Model Tree tab (you can use the search function text box, or press CTRL + F, to search for any element).
2. Drag the element(s) into the state diagram.

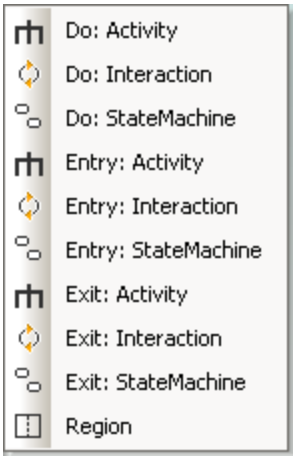
9.2 Creating states, activities and transitions

To insert a simple state:

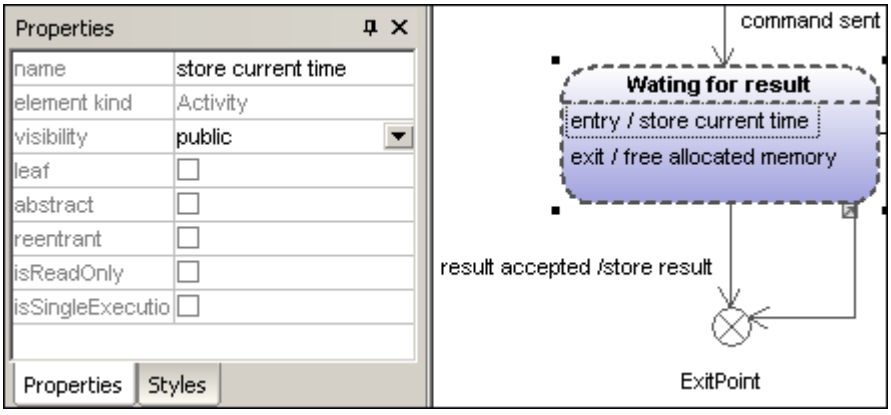
1. Click the state icon  in the icon bar and click in the State diagram to insert it.
2. Enter the name of the state and press Enter to confirm.
   Simple states do not have any regions or any other type of substructure. UModel allows you to add activities as well as regions to a simple state through the context menu.

To add an activity to a state:

1. Right click the state element, select New, and then one of the entries from the context menu.



You can select one action from the Do, Entry and Exit action categories. Activities are placed in their own compartment in the state element, though not in a separate region. The type of activity that you select is used as a prefix for the activity e.g. **entry / store current time**.

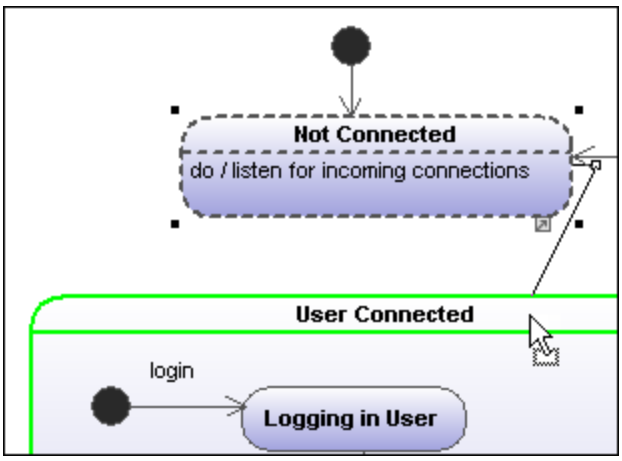


To delete an activity:

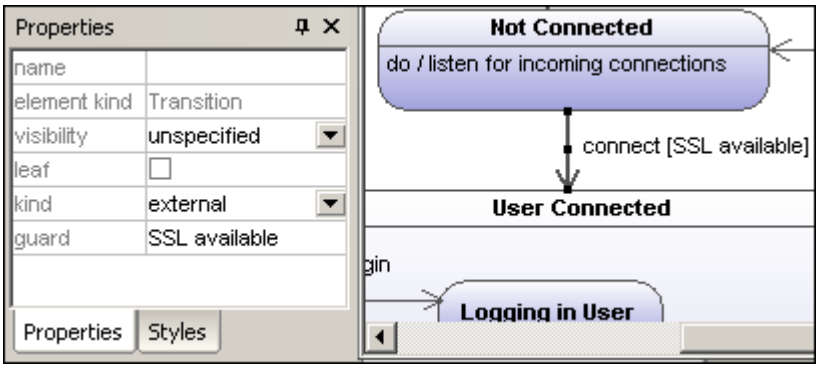
1. Click the respective activity in the state element and press the Del. key.

To create a transition between two states:

1. Click the Transition handle of the source state (on the right of the element).
2. Drag-and-drop the transition arrow onto the target state.



The Transition properties are now visible in the Properties tab. Clicking the "kind" combo box, allows you to define the transition type: external, internal or local.



Transitions can have an event trigger, a guard condition and an action in the form **eventTrigger [guard condition] /activity**.

To create a transition trigger:

1. Right click a previously created transition (arrow).
2. Select **New | Trigger**.

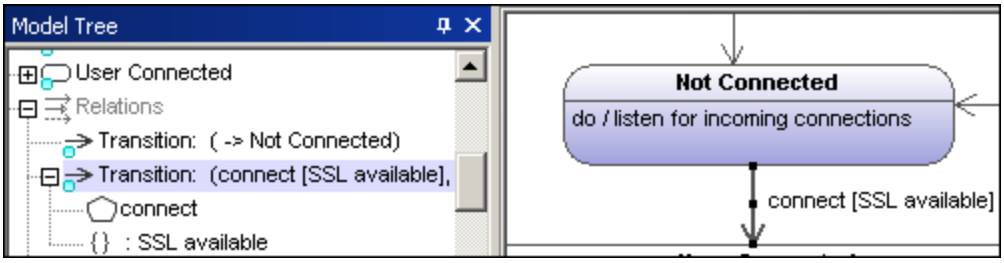
An "a" character appears in the transition label above the transition arrow, if it is the first trigger in the state diagram. Triggers are assigned default values of the form alphabetic letter, source state -> target state.

3. Double click the new character and enter the transition properties in the form **eventTrigger [guard condition] /activity**.

   Transition property syntax; the text entered before the square brackets is the trigger, between brackets the guard condition, and after the slash, the activity. Manipulating this string automatically creates or deletes the respective elements in the Model Tree.

Please note:

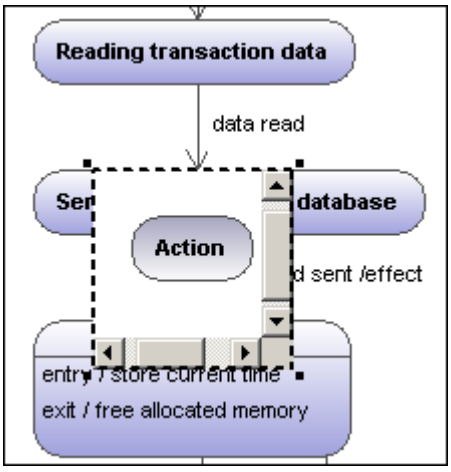
To see the individual transition properties, right click the transition (arrow) and select "Select in Model Tree". The event, activity and constraint elements are all shown below the selected transition.



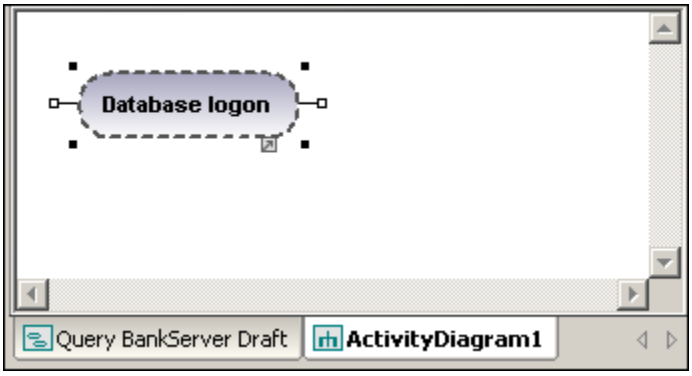
Adding an Activity diagram to a transition:

UModel has the unique capability of allowing you to add an Activity diagram to a transition, to describe the transition in more detail.

1. Right click a transition arrow in the diagram, and select **New | Activity Diagram**. This inserts an Activity diagram window into the diagram at the position of the transition arrow.
2. Click the inserted window to make it active. You can now use the scroll bars to scroll within the window.

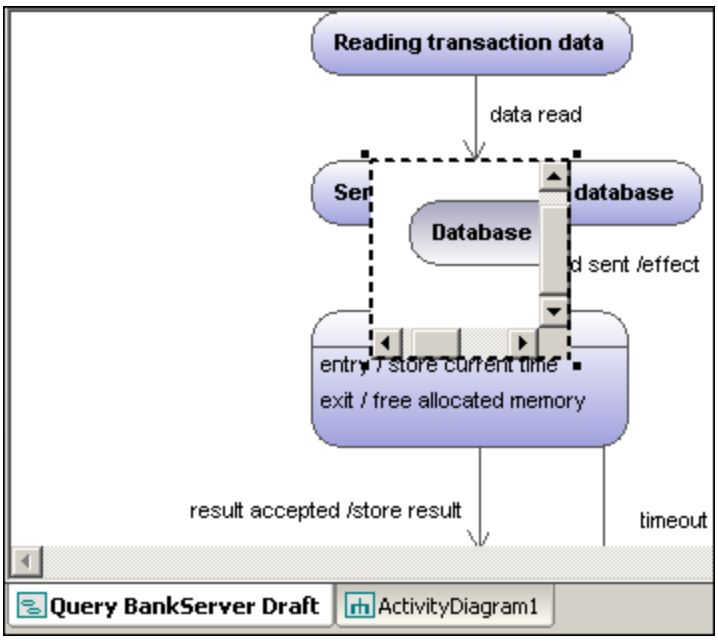


3. Double click the Action window to switch into the Activity diagram and further define the transition, e.g. change the Action name to Database logon.

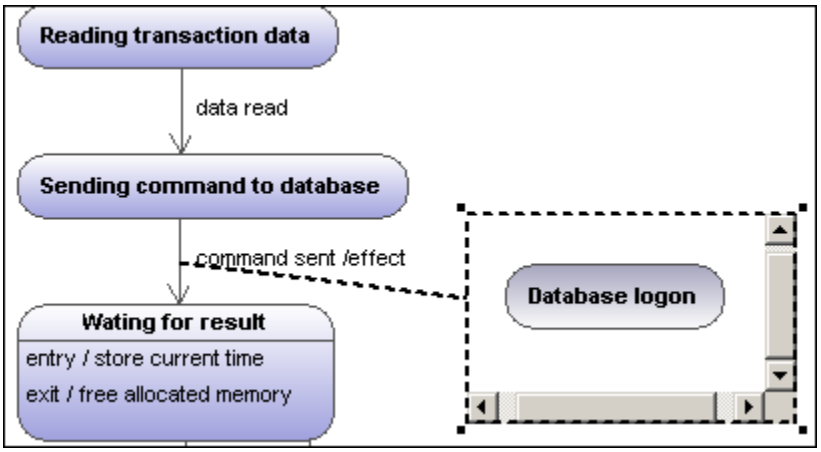


Note that a new Activity Diagram tab has now been added to the project. You can add any activity modeling elements to the diagram, please see "Activity Diagram" for more information.

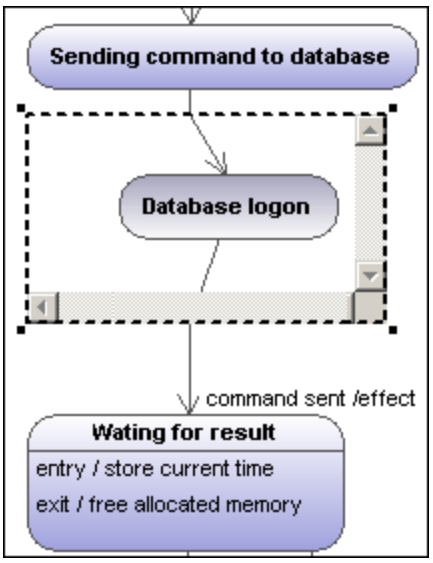
4. Click the State Machine Diagram tab to switch back to see the update transition.



5. Drag the Activity window to reposition it in the diagram, and click the resize handle if necessary.



Dragging the Activity window between the two states, displays the transition in and out of the activity.



9.3 Composite states

Composite state

This type of state contains a second compartment comprised of a single region. Any number of states may be placed within this region.

To add a region to a composite state:

1. Right click the composite state and select **New | Region** from the context menu. A new region is added to the state. Regions are divided by dashed lines.

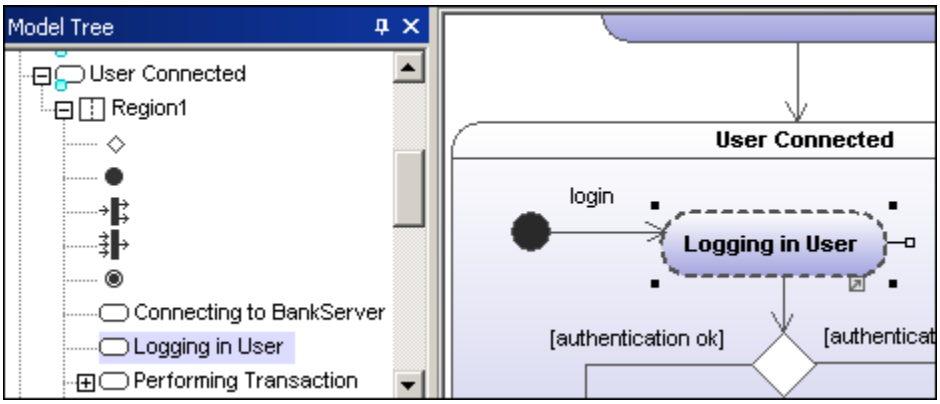
To delete a region:

1. Click the region you want to delete in the composite state and press the Del. key. Deleting a region of an orthogonal state reverts it back to a composite state; deleting the last region of a composite state changes it back to a simple state.

To place a state within a composite state:

1. Click the state element you want to insert (e.g. Logging in User), and drop it into the region compartment of the composite state.

   The region compartment is highlighted when you can drop the element. The inserted element is now part of the region, and appears as a child element of the region in the Model Tree pane.

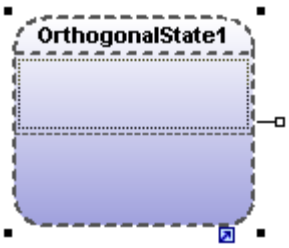


   Moving the composite state moves all contained states along with it.

Orthogonal state

This type of state contains a second compartment comprised of two or more regions, where the separate regions indicate concurrency.

Right clicking a state and selecting **New | Region** allows you add new regions.

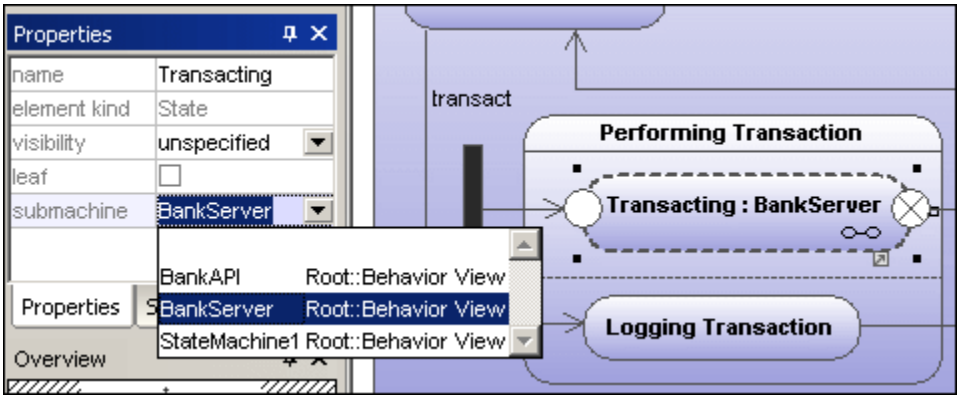


Submachine state

This state is used to hide details of a state machine. This state does not have any regions but is associated to a separate state machine.

To define a submachine state:

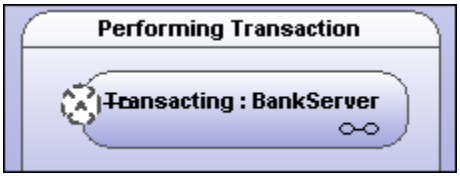
1. Having selected a state, click the **submachine** combo box in the Properties tab. A list containing the currently defined state machines appears.
2. Select the state machine that you want this submachine to reference.



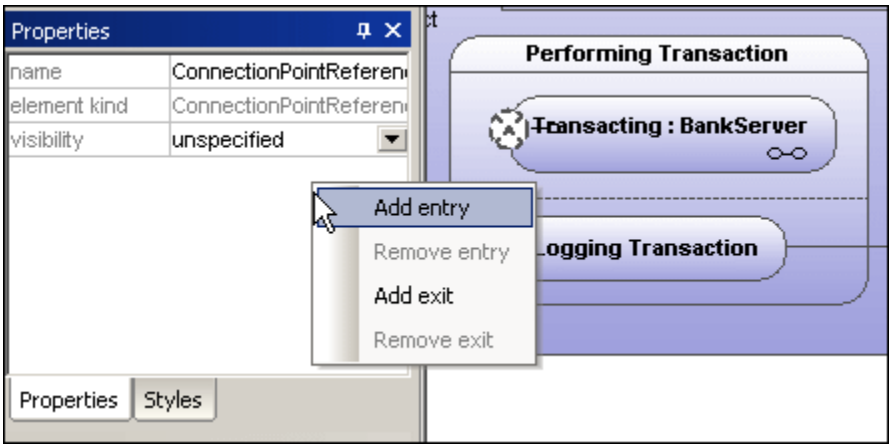
To add entry / exit points to a submachine state:

- The state which the point is connected to, must itself reference a submachine State Machine (visible in the Properties tab).
  - This submachine must contain one or more Entry and Exit points

1. Click the **ConnectionPointReference** icon in the title bar, then click the submachine state that you want to add the entry/exit point to.

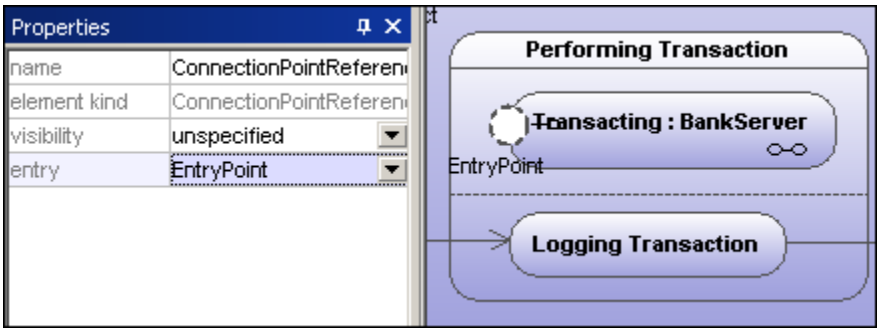


2. Right click in the Properties tab and select Add entry. Please note that another Entry, or Exit Point has to exist elsewhere in the diagram to enable this pop-up menu.



This adds an EntryPoint row to the Properties tab, and changes the appearance of the

ConnectionPointReferece element.



3. Use the same method to insert an ExitPoint, by selecting "Add exit" from the context menu.

9.4 Diagram elements

 Initial state (pseudostate)
The beginning of the process.

 Final state
The end of the sequence of processes.

 Entry point (pseudostate)
The entry point of a state machine or composite state.

 Exit point (pseudostate)
The exit point of a state machine or composite state.

 Choice
This represents a dynamic conditional branch, where mutually exclusive guard triggers are evaluated (OR operation).

 Junction (pseudostate)
This represents an end to the OR operation defined by the Choice element.

 Terminate (pseudostate)
The halting of the execution of the state machine.

 Fork (pseudostate)
Inserts a vertical Fork bar.
Used to divide sequences into concurrent subsequences.

 Fork horizontal (pseudostate)
Inserts a horizontal Fork bar.
Used to divide sequences into concurrent subsequences.

 Join (pseudostate)
Joins/merges previously defined subsequences. All activities have to be completed before progress can continue.

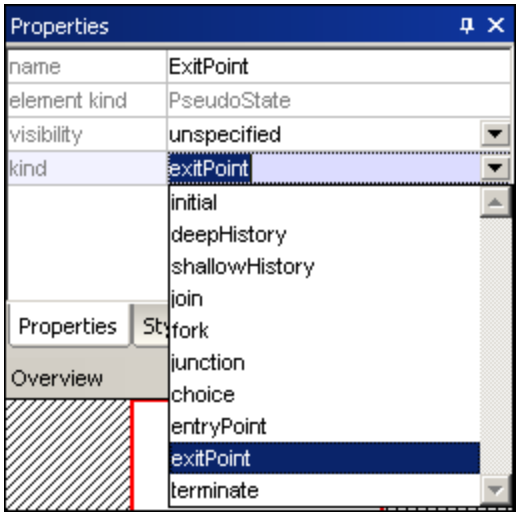
 Join horizontal (pseudostate)
Joins/merges previously defined subsequences. All activities have to be completed before progress can continue.

 Deep history
A pseudostate that restores the previously active state within a composite state.

 Shallow history

A pseudostate that restores the initial state of a composite state.

All pseudostate elements can be changed to a different "type", by changing the **kind** combo box entry in the Properties tab.



 Connection point reference
A connection point reference represents a usage (as part of a submachine state) of an entry/exit point defined in the
statemachine reference by the submachine state.

To add Entry or Exit points to a connection point reference:

- The state which the point is connected to, must itself reference a submachine State Machine (visible in the Properties tab).
- This submachine must contain one or more Entry and Exit points

 Transition
A direct relationship between two states. An object in the first state performs one or more actions and then enters the second state depending on an event and the fulfillment of any guard conditions.

Transitions have an event trigger, guard condition(s), an action (behavior), and a target state.

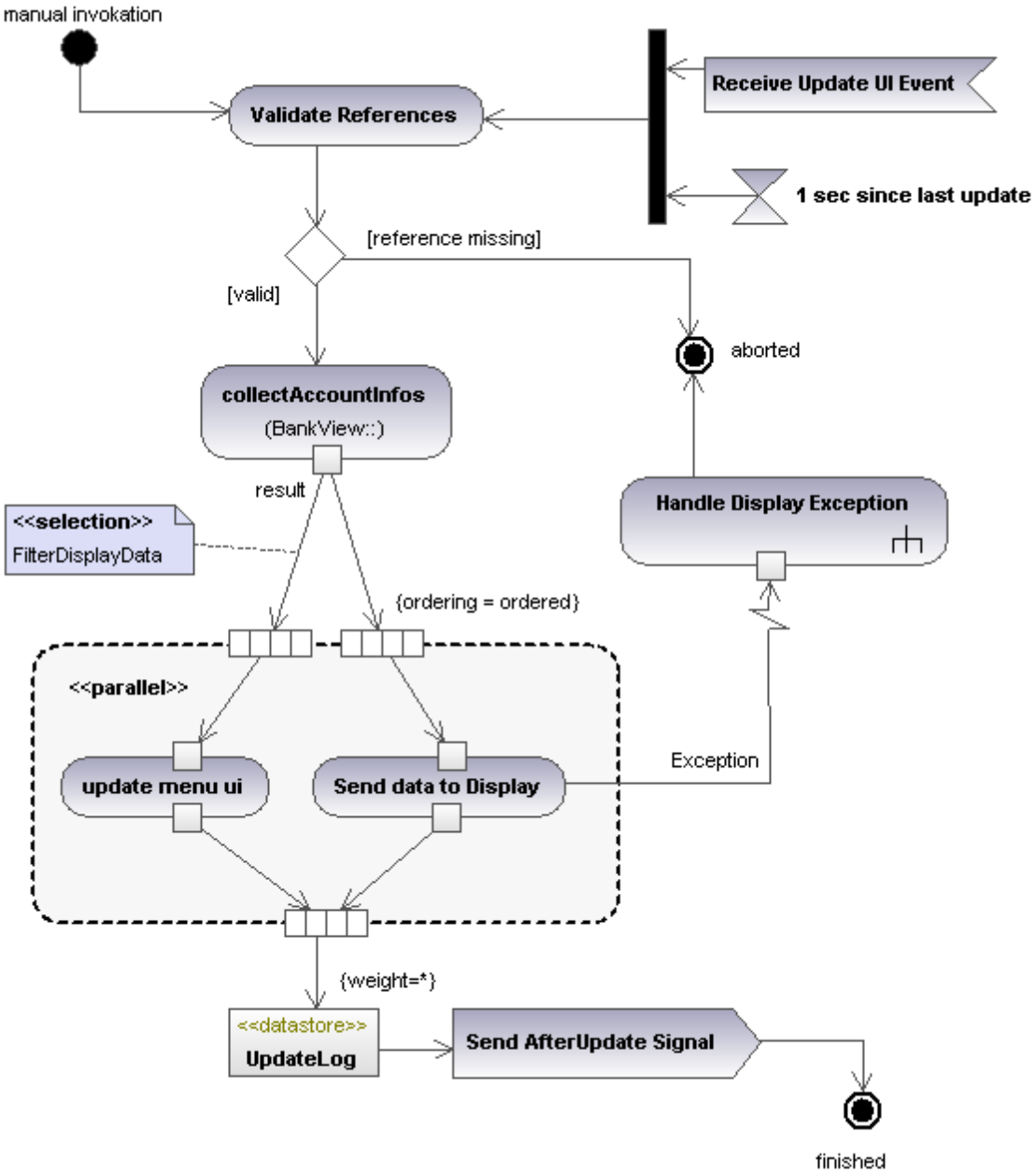
Chapter 10

Activity Diagram

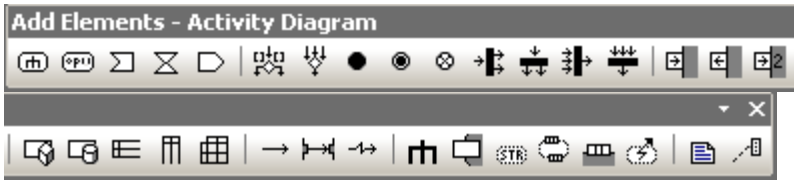
10 Activity Diagram

Activity diagrams are useful for modeling real-world workflows of business processes, and display which actions need to take place and what the behavioral dependencies are. The Activity diagram describes the specific sequencing of activities and supports both conditional and parallel processing. The Activity diagram is a variant of the State diagram, with the states being activities.

Please note that the Activity diagram shown in the following section is available in the **Bank_MultiLanguage.ump** sample, in the ...\UModelExamples folder supplied with UModel.



10.1 Inserting Activity Diagram elements



Using the toolbar icons:

1. Click the specific activity diagram icon in the Activity Diagram toolbar.
2. Click in the Activity Diagram to insert the element.
   Note that holding down CTRL and clicking in the diagram tab, allows you to insert multiple elements of the type you selected.

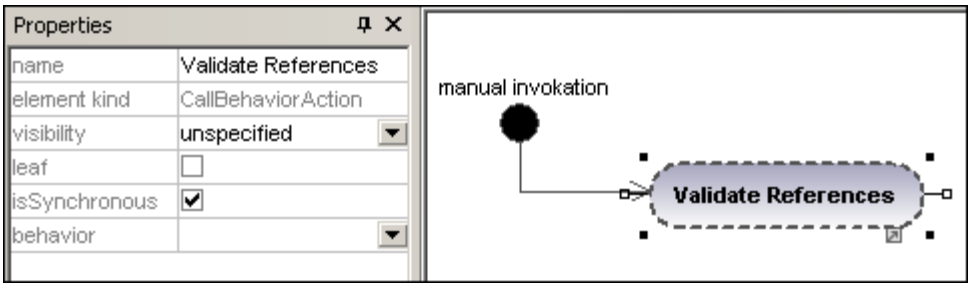
Dragging existing elements into the activity diagram:

Most elements occurring in other activity diagrams, can be inserted into an existing activity diagram.

1. Locate the element you want to insert in the Model Tree tab (you can use the search function text box, or press CTRL + F, to search for any element).
2. Drag the element(s) into the activity diagram.

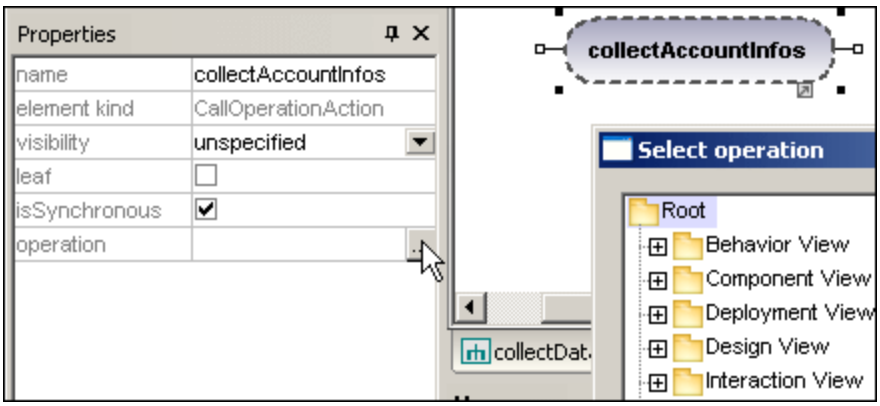
Inserting an action (CallBehavior):

1. Click the Action (CallBehavior) icon  in the icon bar, and click in the Activity diagram to insert it.
2. Enter the name of the Action, e.g. Validate References, and press Enter to confirm.



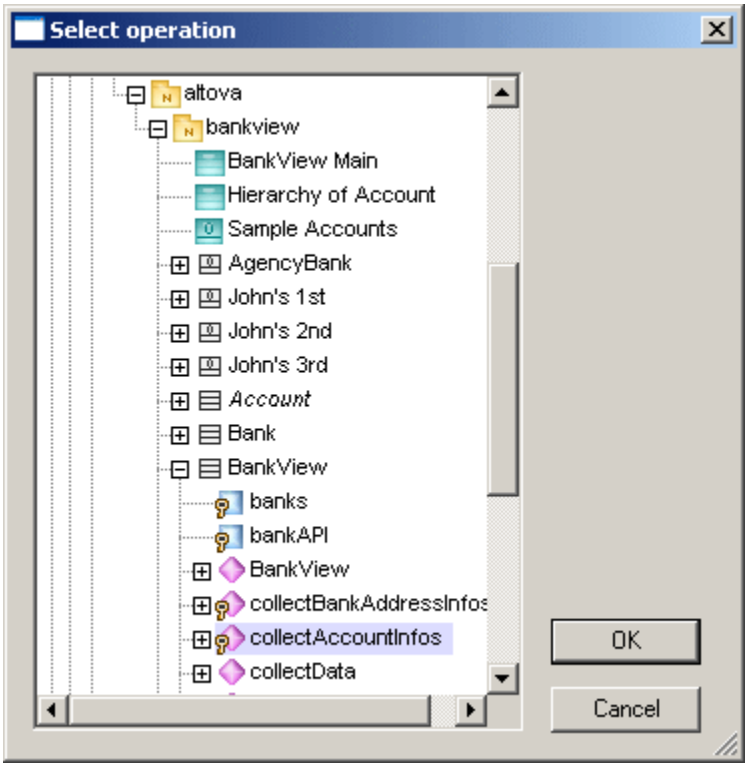
Inserting an action (CallOperation) and selecting a specific operation:

1. Click the Action (CallOperation) icon  in the icon bar, and click in the Activity diagram to insert it.
2. Enter the name of the Action, e.g. collectAccountInfo, and press Enter to confirm.
3. Click the Browse button to the right of the operation field in the Properties tab.

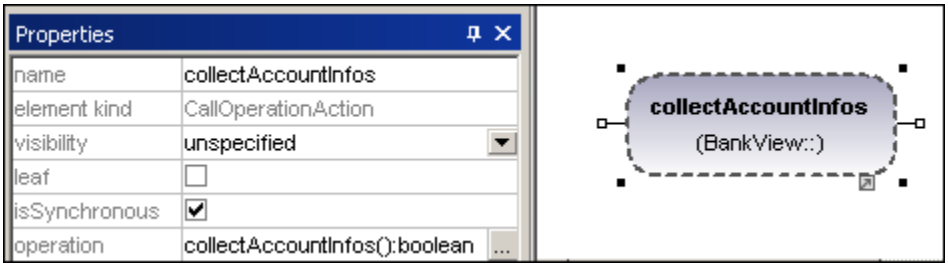


This opens the "Select Operation" dialog box in which you can select the specific operation.

4. Navigate to the specific operation that you want to insert, and click OK to confirm.



In this example the operation "collectAccountInfos" is in the BankView class.



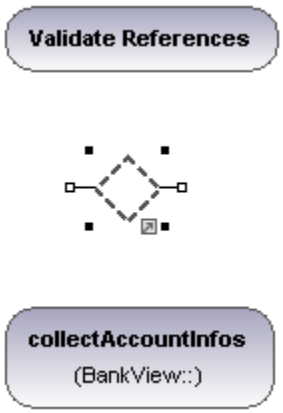
10.2 Creating branches and merges

Creating a branch (alternate flow)
A branch has a single incoming flow and multiple outgoing guarded flows. Only one of the outgoing flows can be traversed, so the guards should be mutually exclusive.

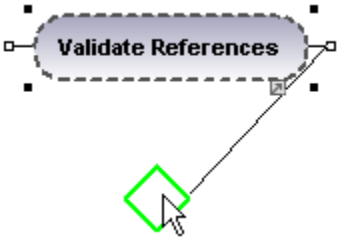
In this example the (BankView) references are to be validated:

- branch1 has the guard "reference missing", which transitions to the abort activity
- branch2 has the guard "valid", which transitions to the collectAccountInfos activity.

1. Click the **DecisionNode** icon  in the title bar, and insert it in the Activity diagram.

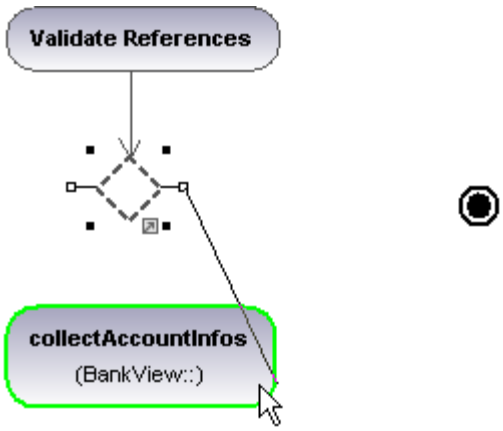


2. Click the ActivityFinalNode icon  which represents the abort activity, and insert it into the Activity diagram.
3. Click the Validate References activity to select it, then click the right-hand handle, **ControlFlow**, and drag the resulting connector onto the DecisionNode element.

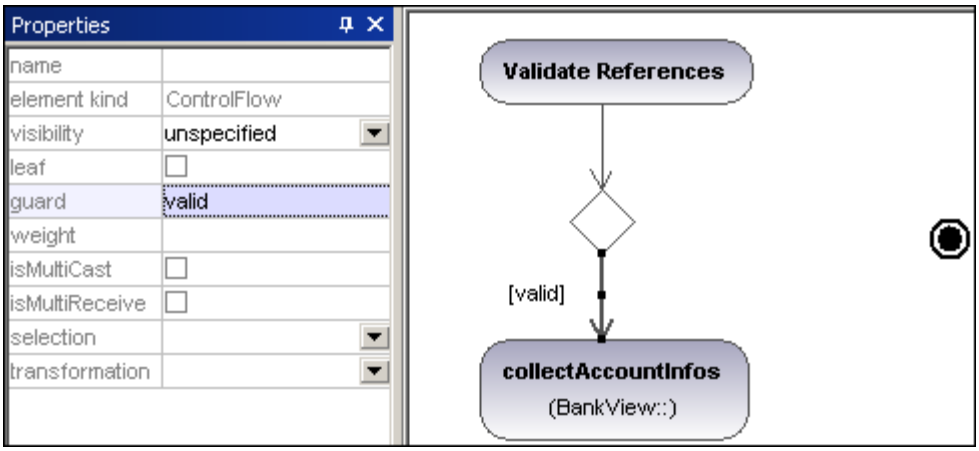


The element is highlighted when you can drop the connector.

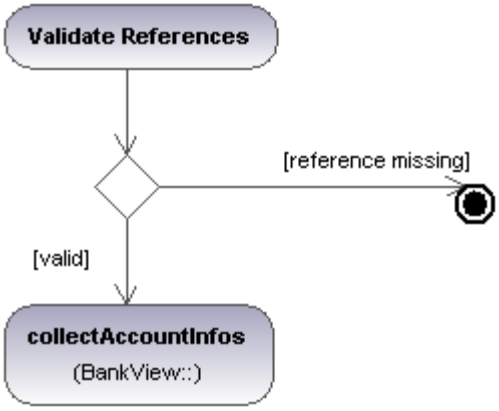
4. Click the DecisionNode element, click the right-hand connector, **ControlFlow**, and drop it on the collectAccountInfos action. Please see "Inserting an Action (CallOperation" for more information.



5. Enter the guard condition "valid", in the guard field of the Properties tab.



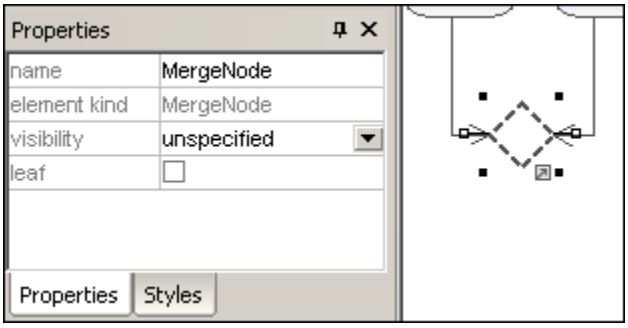
6. Click the **DecisionNode** element and drag from the right-hand handle, **ControlFlow**, and drop it on the ActivityFinalNode element.
The guard condition on this transition is automatically defined as "else". Double click the guard condition in the diagram to change it e.g. "reference missing".



Please note that UModel does not validate, or check, the number of Control/Object Flows in a diagram.

Creating a merge:

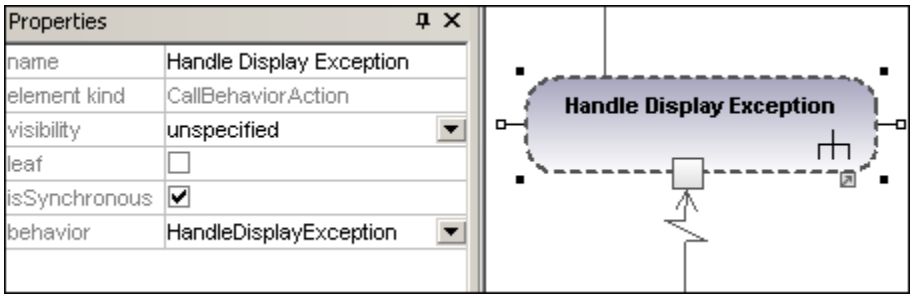
1. Click the MergeNode icon  in the icon bar, then click in the Activity diagram to insert it.



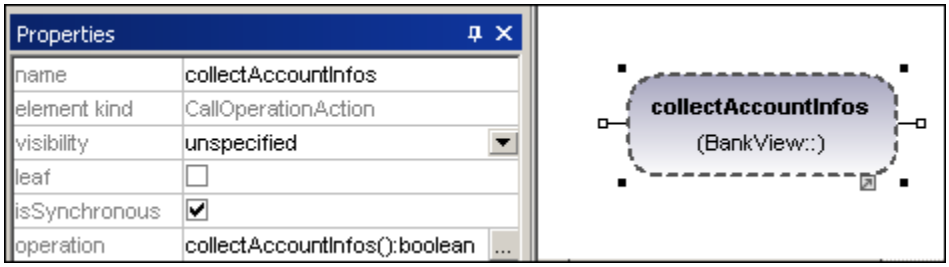
2. Click the ControlFlow (ObjectFlow) handles of the actions that are to be merged, and drop the arrow(s) on the MergeNode symbol.

10.3 Diagram elements


Action (CallBehavior)
Inserts the Call Behavior Action element which directly invokes a specific behavior.
Selecting an existing behavior using the **behavior** combo box, e.g. HandleDisplayException, and displays a rake symbol within the element.

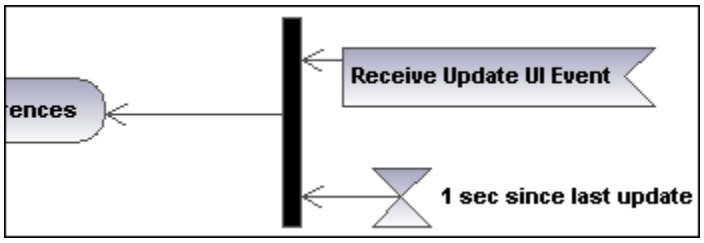



Action (CallOperation)
Inserts the Call Operation Action which indirectly invokes a specific behavior as a method.
Please see "Inserting an action (CallOperation)" for more information.

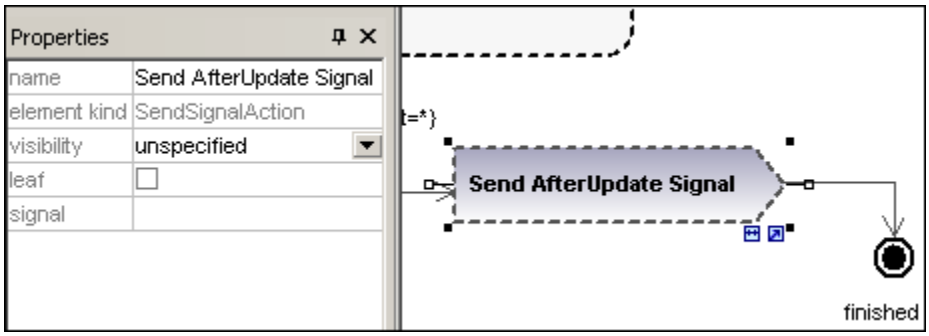



AcceptEventAction
Inserts the Accept Event action which waits for the occurrence of an event which meets specific conditions.

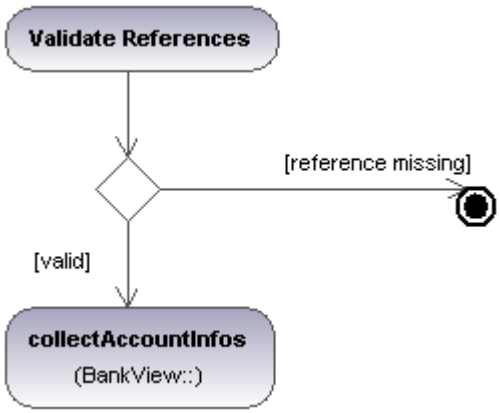

AcceptEventAction (TimeEvent)
Inserts a AcceptEvent action, triggered by a time event, which specifies an instant of time by an expression e.g. 1 sec. since last update.




SendSignalAction
Inserts the Send Signal action, which creates a signal from its inputs and transmits the signal to the target object, where it may cause the execution of an activity.



DecisionNode
Inserts a Decision Node which has a single incoming transition and multiple outgoing guarded transitions. Please see "Creating a branch" for more information.



MergeNode
Inserts a Merge Node which merges multiple alternate transitions defined by the Decision Node. The Merge Node does not synchronize concurrent processes, but selects one of the processes.

InitialNode
The beginning of the activity process. An activity can have more than one initial node.

ActivityFinalNode
The end of the activity process. An activity can have more that one final node, all flows in the activity stop when the "first" final node is encountered.

FlowFinalNode
Inserts the Flow Final Node, which terminates a flow. The termination does not affect any other flows in the activity.

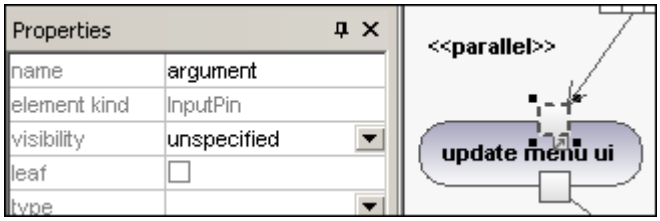
ForkNode
Inserts a vertical Fork node.
Used to divide flows into multiple concurrent flows.

 ForkNode (Horizontal)
Inserts a horizontal Fork node.
Used to divide flows into multiple concurrent flows.

 JoinNode
Inserts a vertical Fork node.
A Join node synchronizes multiple flows defined by the Fork node.

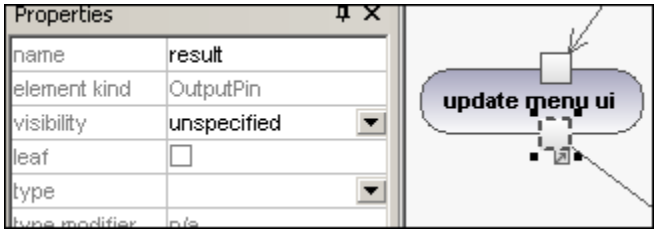
 Join Node (horizontal)
Inserts a horizontal Fork node.
A Join node synchronizes multiple flows defined by the Fork node.

 InputPin
Inserts an input pin onto a Call Behavior, or Call Operation action. Input pins supply input values that are used by an action. A default name, "argument", is automatically assigned to an input pin.



The input pin symbol can only be placed onto those activity elements where the mouse pointer changes to the hand symbol  . Dragging the symbol repositions it on the element border.

 OutputPin
Inserts an output pin action. Output pins contain output values produced by an action. A name corresponding to the UML property of that action e.g. result, is automatically assigned to the output pin.



The output pin symbol can only be placed onto those activity elements where the mouse pointer changes to the hand symbol  . Dragging the symbol repositions it on the element border.

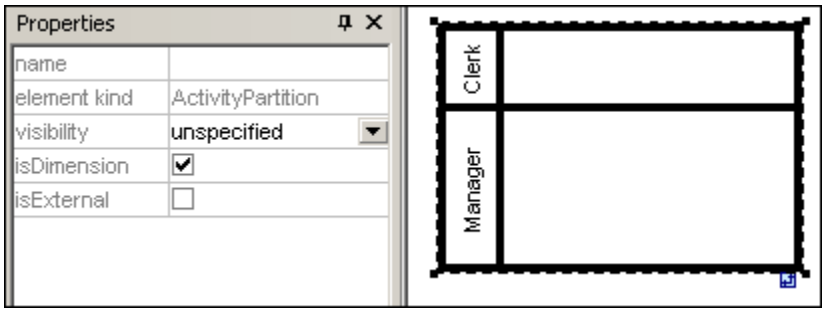
 ValuePin
Inserts a Value Pin which is an input pin that provides a value to an action, that does not come from an incoming object flow. It is displayed as an input pin symbol, and has the same properties as an input pin.

 CentralBufferNode

Inserts a Central Buffer Node which acts as a buffer for multiple in- and out flows from other object nodes.

 DataStoreNode
Inserts a Data Store Node which is a special "Central Buffer Node" used to store persistent (i.e. non transient) data.

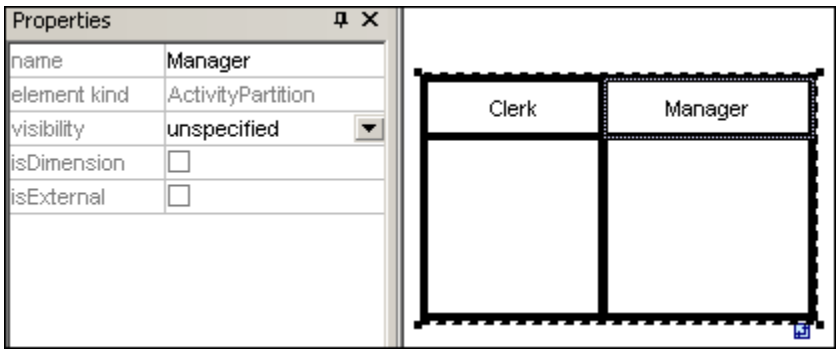
 ActivityPartition (horizontal)
Inserts a horizontal Activity Partition, which is a type of activity group used to identify actions that have some characteristic in common. This often corresponds to organizational units in a business model.



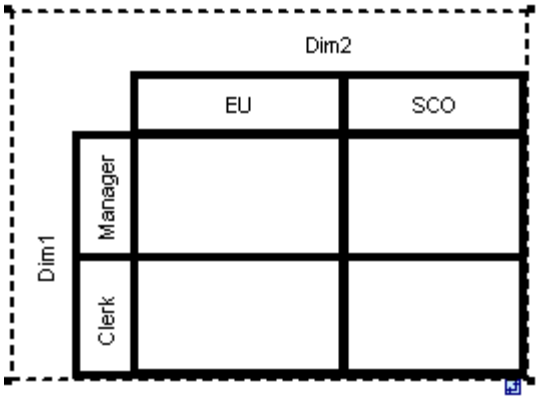
Double clicking a label allows you to edit it directly; pressing Enter orients the text correctly.

Please note that Activity Partitions are the UML 2.0 update to the "swimlane" functionality of previous UML versions.

 ActivityPartition (vertical)
Inserts a vertical Activity Partition, which is a type of activity group used to identify actions that have some characteristic in common. This often corresponds to organizational units in a business model.

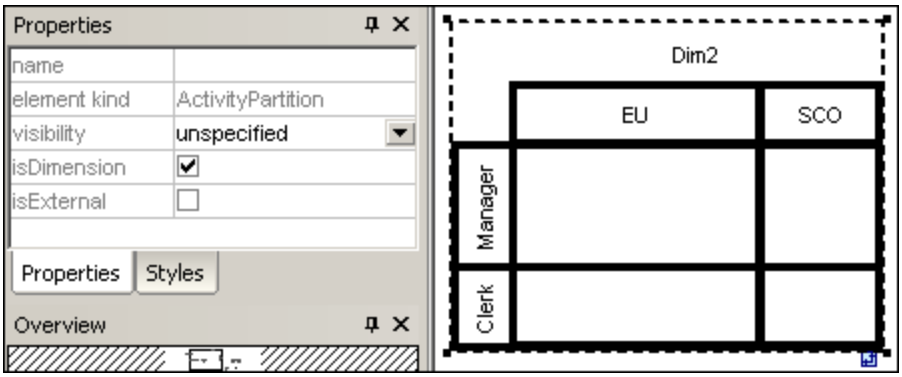


 ActivityPartition (2 Dimensional)
Inserts a two dimensional Activity Partition, which is a type of activity group used to identify actions that have some characteristic in common. Both axes have editable labels.



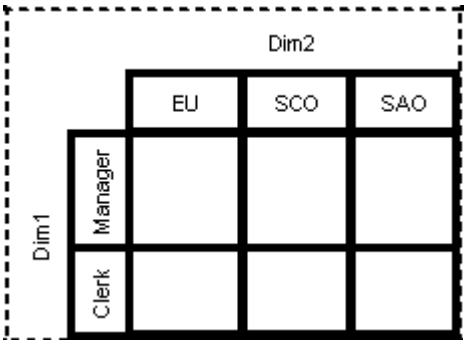
To remove the Dim1, Dim2 dimension labels:

1. Click the dimension label you want to remove e.g. Dim1
2. Double click in the Dim1 entry in the Properties tab, delete the Dim1 entry, and press Enter to confirm.



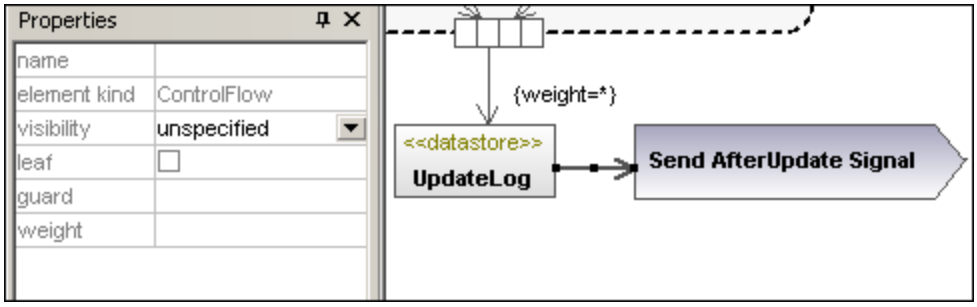
Note that Activity Partitions can be nested:

1. Right click the label where you want to insert a new partition.
2. Select **New | ActivityPartition**.



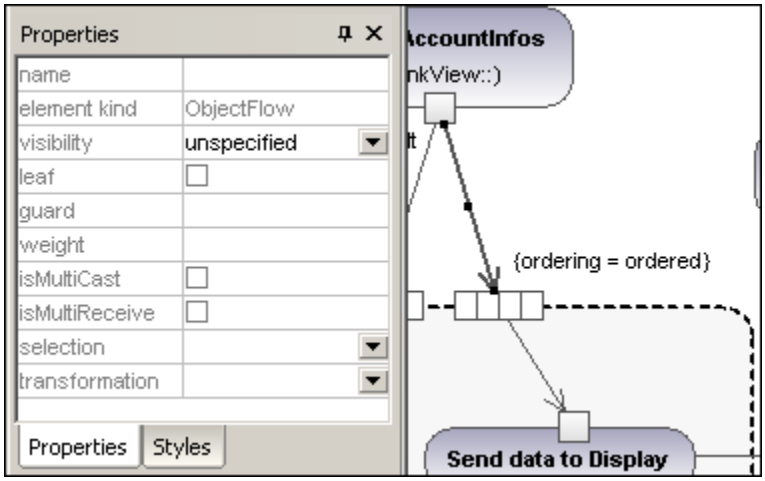

ControlFlow

A Control Flow is an edge, i.e. an arrowed line, that connects two activities/behaviours, and starts an activity after the previous one has been completed.



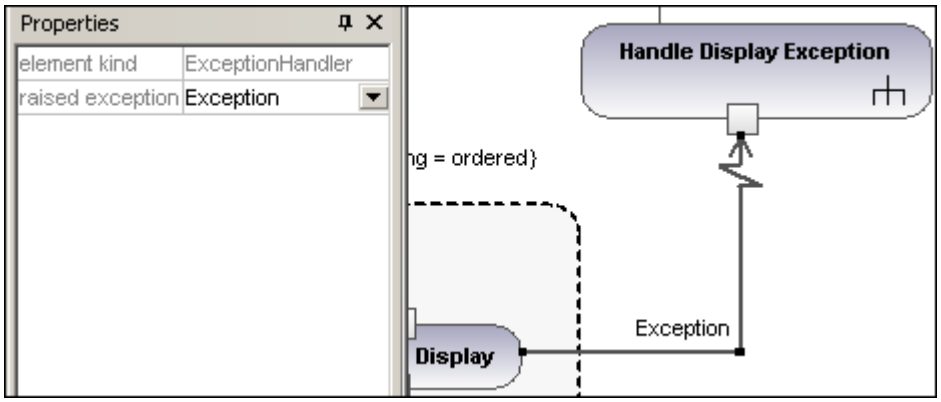
 ObjectFlow

A Object Flow is an edge, i.e. an arrowed line, that connects two actions/object nodes, and starts an activity after the previous one has been completed. Objects or data can be passed along an Object Flow.



 ExceptionHandler

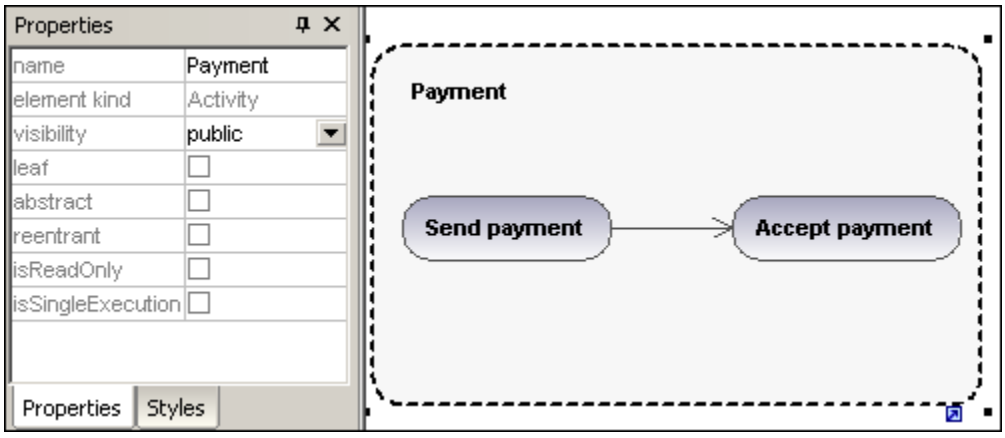
An Exception Handler is an element that specifies what action is to be executed if a specified exception occurs during the execution of the protected node.



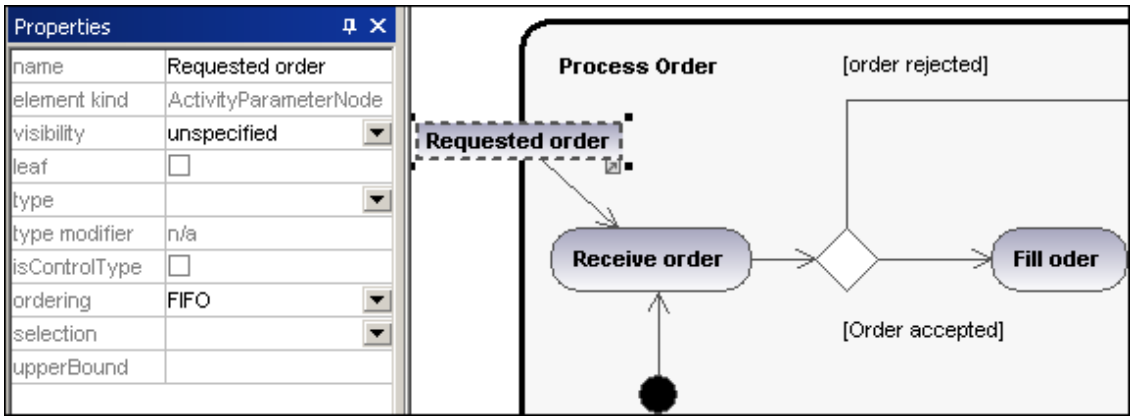
An Exception Handler can only be dropped on an Input Pin of an Action.

 Activity

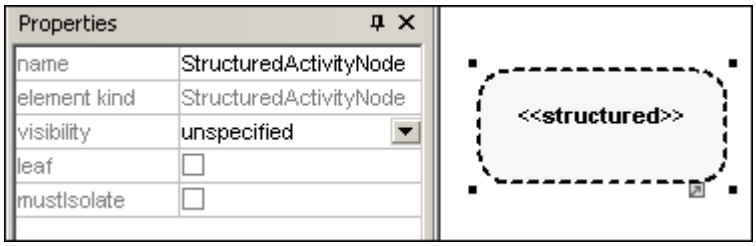
Inserts an Activity into the activity diagram.



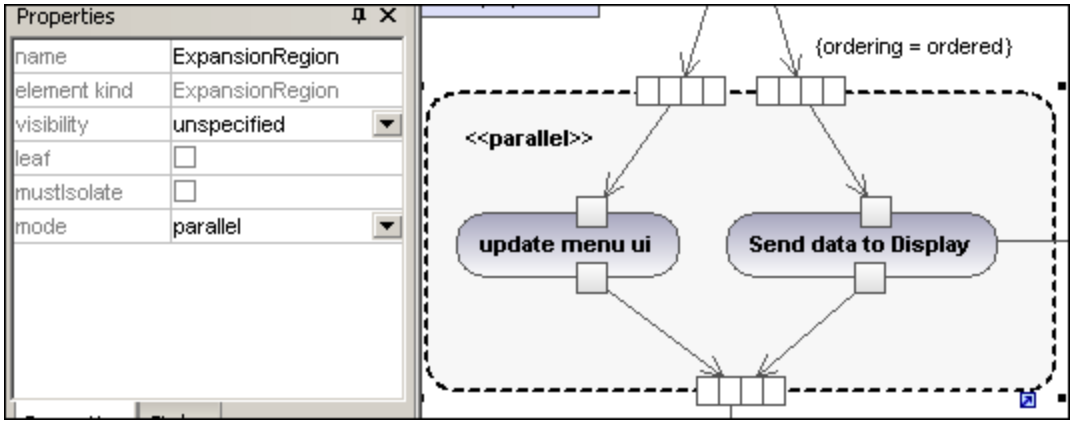
 ActivityParameterNode
Inserts an Activity Parameter node onto an activity. Clicking anywhere in the activity places the parameter node on the activity boundary.



 StructuredActivityNode
Inserts a Structured Activity Node which is a structured part of the activity, that is not shared with any other structured node.

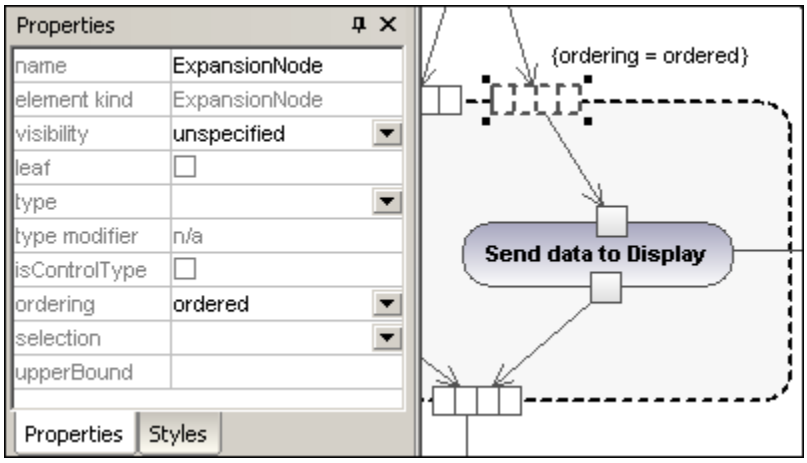


 ExpansionRegion
An expansion region is a region of an activity having explicit input and outputs (using ExpansionNodes). Each input is a collection of values.



The expansion region mode is displayed as a keyword, and can be changed by clicking the "mode" combo box in the Properties tab. Available settings are:parallel, iterative, or stream.

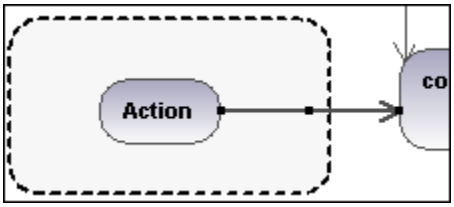

ExpansionNode
Inserts an Expansion Node onto an Expansion Region. Expansion nodes are input and output nodes for the Expansion Region, where each input/output is a collection of values. The arrows into, or out of, the expansion region, determine the specific type of expansion node.



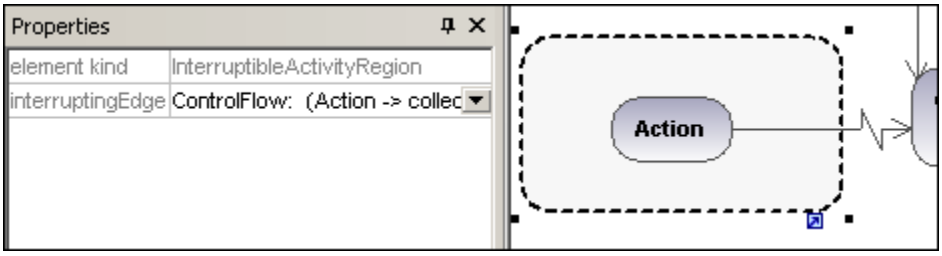

InterruptableActivityRegion
An interruptible region contains activity nodes. When a control flow leaves an interruptible region all flows and behaviors in the region are terminated.

To add an interrupting edge:
Making sure that:

- an Action element is present in the InterruptableActivityRegion, as well as an outgoing Control Flow to another action:



1. Right click the Control Flow arrow, and select **New | InterruptingEdge**.



Please note:

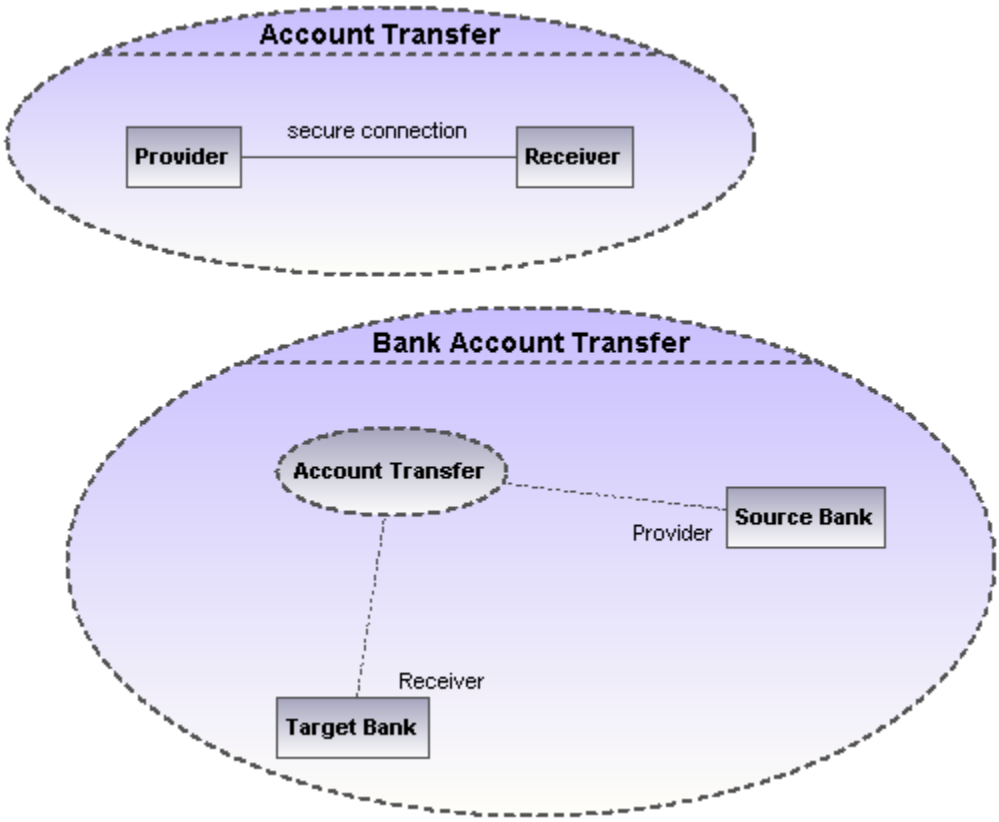
You can also add an InterrupingEdge by clicking the InterruptableActivityRegion, right clicking in the Properties window, and selecting Add InterruptingEdge from the pop-up menu.

Chapter 11

Composite Structure Diagram

11 Composite Structure Diagram

The Composite Structure Diagram has been added in UML 2.0 and is used to show the internal structure, including parts, ports and connectors, of a structured classifier, or collaboration.



11.1 Inserting Composite Structure Diagram elements

Using the toolbar icons:

1. Click the specific Composite Structure diagram icon in the toolbar.
2. Click in the Composite Structure diagram to insert the element.
   Note that holding down CTRL and clicking in the diagram tab, allows you to insert multiple elements of the type you selected.

Dragging existing elements into the Composite Structure diagram:

Most elements occurring in other Composite Structure diagrams, can be inserted into an existing Composite Structure diagram.

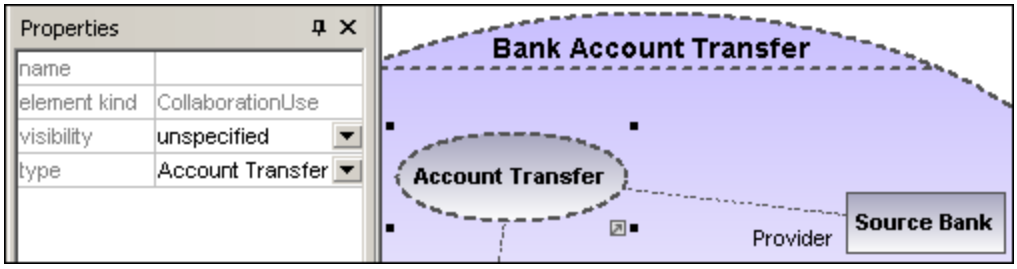
1. Locate the element you want to insert in the Model Tree tab (you can use the search function text box, or press CTRL + F, to search for any element).
2. Drag the element(s) into the Composite Structure diagram.

 Collaboration

Inserts a collaboration element which is a kind of classifier/instance that communicates with other instances to produce the behavior of the system.

 Collaboration Use

Inserts a Collaboration use element which represents one specific use of a collaboration involving specific classes or instances playing the role of the collaboration. A collaboration use is shown as a dashed ellipse containing the name of the occurrence, a colon, and the name of the collaboration type.



When creating dependencies between collaboration use elements, the "type" field must be filled to be able to create the role binding, and the target collaboration must have at least one part/ role.

 Part (Property)

Inserts a part element which represents a set of one or more instances that a containing classifier owns. A Part can be added to collaborations and classes.

 Port

Inserts a port element which defines the interaction point between a classifier and its environment, and can be added on parts with a defined type.


Class
Inserts a Class element, which is the actual classifier that occurs in that particular use of the collaboration.


Connector
Inserts a Connector element which can be used to connect two or more instances of a part, or a port. The connector defines the relationship between the objects and identifies the communication between the roles.


Dependency (Role Binding)
Inserts the Dependency element, which indicates which connectable element of the classifier or operation, plays which role in the collaboration.

Chapter 12

XMI - XML Metadata Interchange

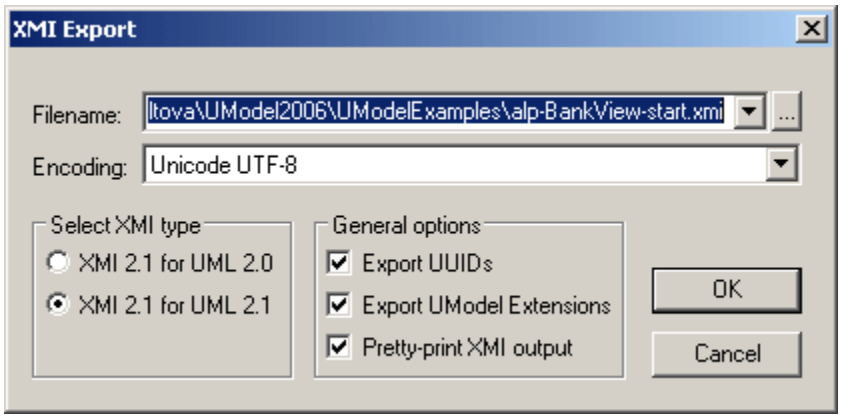
12 XMI - XML Metadata Interchange

UModel supports the export and import of XMI 2.1 for UML 2.0 and 2.1.

Select the menu item **File | Export to XMI File** to generate an XMI file from the UModel project, and File | Import from XMI File, to import a previously generated XMI file.

The XMI Export dialog box allows you to select the specific XMI format you want to output, XMI for UML 2.0/2.1. During the export process included files, even those defined as "include by reference" are also exported.

Please note:
If you intend to **reimport** generated XMI code into UModel, please make sure that you activate the "Export UModel Extensions" check box.



XMI defines three versions of element identification: IDs, UUIDs and labels.

- IDs are unique within the XMI document, and are supported by most UML tools. UModel exports these type of IDs by default, i.e. none of the checkboxes need activated.
- UUID are Universally Unique Identifiers, and provide a mechanism to assign each element a global unique identification, GUID. These IDs are globally unique, i.e. they are not restricted to the specific XMI document. UUIDs are generated by selecting the "Export UUIDs" checkbox.
- Labels are not supported by UModel.

Please note:
The XMI import process automatically supports both types of IDs.

XMI extensions
XMI defines an "extension mechanism" which allows each application to export its tool-specific extensions to the UML specification. If you select this option, other UML tools will only be able to import the standard UML data (ignoring the UModel extensions). This UModel extension data will be available when importing into UModel.

Data such as the file names of classes, or element colors, are not part of the UML specification and thus have to be deleted in XMI, or be saved in "Extensions". If they have been exported as extensions and re-imported, all file names and colors will be imported as defined. If extensions are not used for the export process, then these UModel-specific data will be lost.

When importing an XMI document, the format is automatically detected and the model generated.

Pretty-print XMI output
This option outputs the XMI file with XML appropriate tag indentation and carriage returns/line feeds.

Chapter 13

UModel Diagram icons

13 UModel Diagram icons

The following section is a quick guide to the icons that are made available in each of the modeling diagrams.

The icons are split up into two sections:

- **Add** - displays a list of elements that can be added to the diagram.
- **Relationship** - displays a list of relationship types that can be created between elements in the diagram.

13.1 Use Case diagram

Add:
Package
Actor
Use case

Relationship:
Association
Generalization
Include
Extend

Note
Note Link

13.2 Class Diagram

Relationship:
Association
Aggregation
Composition
AssociationClass
Dependency
Usage
InterfaceRealization
Generalization

Add:
Package
Class
Interface
Enumeration
Datatype
PrimitiveType
Profile
Stereotype
ProfileApplication
InstanceSpecification

Note
Note Link

13.3 Object Diagram

Relationship:
Association
AssociationClass
Dependency
Usage
InterfaceRealization
Generalization

Add:
Package
Class
Interface
Enumeration
Datatype
PrimitiveType
InstanceSpecification

Note
Note Link

13.4 Component Diagram

Add:
Package
Interface
Class
Component
Artifact

Relationship:
Realization
InterfaceRealization
Usage

Note
Note Link

13.5 Deployment Diagram

Add:
Package
Component
Artifact
Node
Device
ExecutionEnvironment

Relationship:
Manifestation
Deployment
Association
Generalization
Dependency

Note
Note Link

13.6 Sequence Diagram

Add
Lifeline
Combined Fragment
Combined Fragment (Alternatives)
Combined Fragment (Loop)
Interaction Use
Gate
State Invariant

Message (Call)
Message (Reply)
Message (Creation)
Message (Destruction)

Asynchronous Message (Call)
Asynchronous Message (Reply)
Asynchronous Message (Destruction)

Note
Note Link

No message numbering
Simple message numbering
Nested message numbering

Toggle dependent message movement

13.7 State Machine Diagram

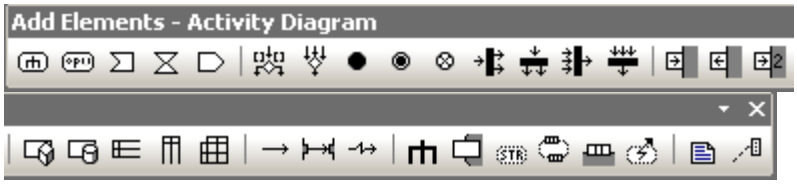
Add
Simple state
Composite state
Orthogonal state
Submachine state

Initial state
Final state
Entry point
Exit point
Choice
Junction
Terminate
Fork (vertical)
Fork (horizontal)
Join
Join (horizontal)
Deep history
Shallow history
Connection point reference

Transition

Note
Note link

13.8 Activity Diagram



Add
Action (CallBehavior)
Action (CallOperation)
Accept Event Action
Accept Event Action (Time Event)
Send Signal Action

Decision Node (Branch)
Merge Node
Initial Node
Activity Final Node
Flow Final Node
Fork Node (vertical)
Fork Node (horizontal)
Join Node
Join Node (horizontal)

Input Pin
Output Pin
Value Pin

Central Buffer Node
Data Store Node
Activity Partition (horizontal)
Activity Partition (vertical)
Activity Partition 2-Dimensional

Control Flow
Object Flow
Exception Handler

Activity
Activity Parameter Node
Structured Activity Node
Expansion Region
Expansion Node
Interruptable Activity Region

Note
Note Link

13.9 Composite Structure Diagram

Add
Collaboration
Collaboration Use
Part
Port
Class

Connector
Dependency (Role Binding)

Note
Note Link

Chapter 14

UModel Reference

14 UModel Reference

The following section lists all the menus and menu options in UModel, and supplies a short description of each.

14.1 File

New
Clears the diagram tab, if a previous project exists, and creates a new UModel project.

Open
Opens previously defined modeling project. Select a previously saved project file ***.ump** from the Open dialog box.

Reload
Allows you to reload the current project and save, or discard, the changes made since you opened the project file.

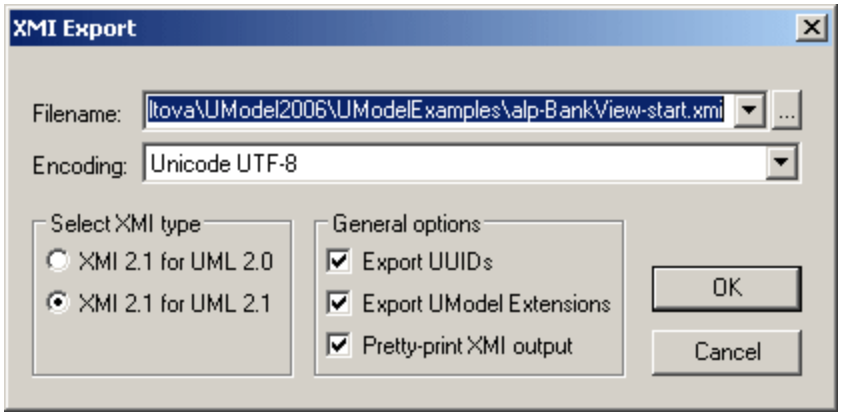
Save
Saves the currently active modeling project using the currently active file name.

Save as
Saves the currently active modeling project with a different name, or allows you to give the project a new name if this is the first time you save it.

Save Diagram as Image
Opens the "Save as..." dialog box and saves the currently active diagram as PNG file.

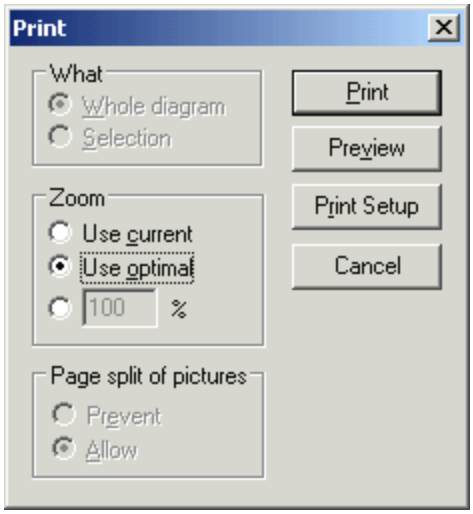
Import from XMI file
Imports a previously exported XMI file. If the file was produced with UModel, then all extensions etc. will be retained.

Export to XMI file
Export the model as an XMI file. You can select the UML version, as well as the specific IDs that you want to export please see XMI - XML Metadata Interchange for more information.



Send by Mail
Opens your default mail application and inserts the current UModel project as an attachment.

Print
Opens the Print dialog box, from where you can print out your modeling project as hardcopy.



"Use current", retains the currently defined zoom factor of the modeling project. Selecting this option enables the "Page split of pictures" group.

The Prevent option prevents modeling elements from being split over a page, and keeps them as one unit.

"Use optimal" scales the modeling project to fit the page size. You can also specify the zoom factor numerically.

Print Preview
Opens the same Print dialog box with the same settings as described above.

Print Setup
Open the Print Setup dialog box in which you can define the printer you want to use and the paper settings.

14.2 Edit

Redo 
The redo command allows you to redo previously undone commands. You can step backward and forward through the undo history using both these commands.

Undo 
UModel has an unlimited number of "Undo" steps that you can use to retrace you modeling steps.

Cut/Copy//Delete
The standard windows Edit commands, allow you to cut, copy, etc., modeling elements, please see "Cut, copy and paste in UModel Diagrams" for more information.

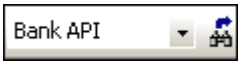
Paste
using the keyboard shortcut CTRL+V, or "Paste" from the context menu, as well as Paste from the Edit menu, always adds a **new** modeling element to the diagram and to the Model Tree, please see "Cut, copy and paste in UModel Diagrams".

Paste in Diagram only
using the context menu, i.e. right clicking on the diagram background, only adds a "link/view" of the existing element, to the current diagram and not to the Model Tree, please see "Cut, copy and paste in UModel Diagrams".

Delete from Diagram only
Deletes the selected modeling elements from the currently active diagram. The deleted elements are not deleted from the modeling project and are available in the Model Tree tab. Note that this option is not available to delete properties or operations from a class, they can be selected and deleted there directly.

Select all
Select all modeling elements of the currently active diagram. Equivalent to the CTRL+A shortcut.

Find
There are several options you can use to search for modeling elements:

- Use the text box in the Main **title bar** 

- Use the menu option Edit | Find
- Press the shortcut **CTRL+F** to open the find dialog box.

Allows you to search for specific text in:

- Any of the three Model Tree panes: Model Tree, Diagram Tree and Favorites tab.
- The Documentation tab of the Overview pane.

- Any currently active diagram.
- The Messages pane.

Find Next  **F3**
Searches for the next occurrence of the same search string in the currently active tab or diagram.

Find Previous SHIFT+F3
Searches for the previous occurrence of the same search string in the currently active tab or diagram.

Copy as bitmap
Copies the currently active diagram into the clipboard from where you can paste it into the application of your choice.

Please note:
Diagrams are copied into the system clipboard, you have to insert them into another application to see, or get access to them.

Copy selection as bitmap
Copies the currently **selected diagram elements** into the clipboard from where you can paste them into the application of your choice.

14.3 Project

Check Project Syntax...
Checks the UModel project syntax. The project file is checked on multiple levels detailed in the tables below:

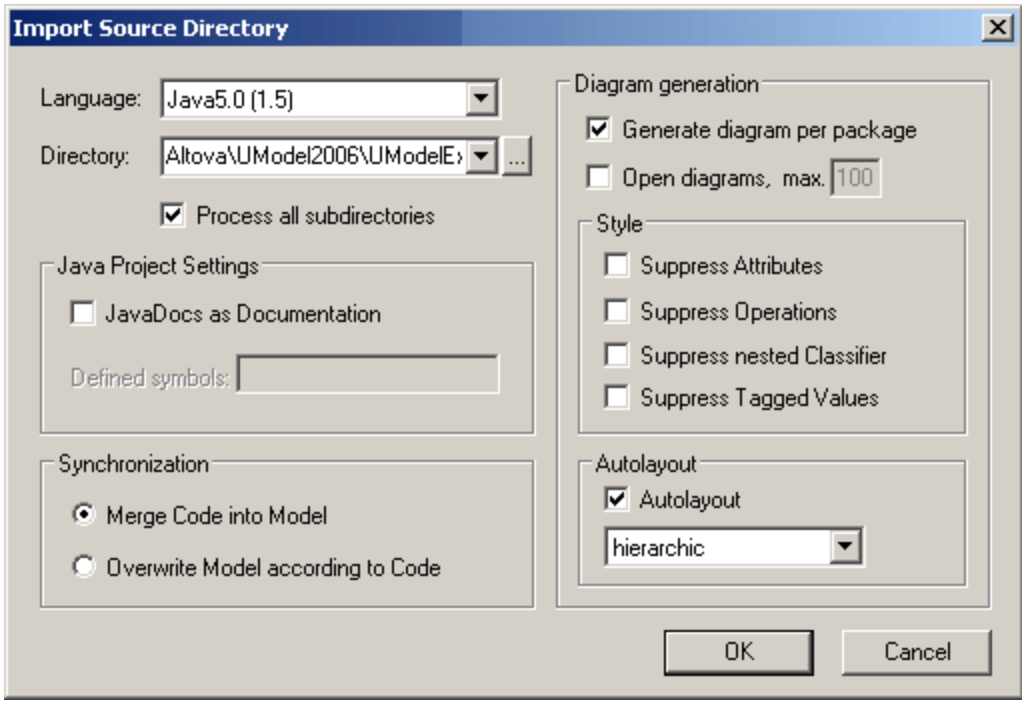
Level	Checks if...	Message...
Project level	at least one Java Namespace Root exists	Error
Components	Project file / Directory is set	Error
	If Realization exists	Error
	"Use for code engineering" check box unchecked: no check is performed and syntax check is disabled.	None
Class	Code file name is set.	**Error** if the local option "Generate missing code file names" is not set. **Warning** if the option is set.
	If class is nested then no check performed.	
	If contained in a code language namespace	Error
	Type for operation parameter is set	Error
	Type for properties is set	Error
	Operation return type is set	Error
	Duplicate operations (names + parameter types)	Error
	If classes are involved in Realization, only if the class is not nested.	Warning
Interface	Code file name is set.	**Error** if the local option "Generate missing code file names" is not set. **Warning** if the option is set.
	Contained in a code language namespace	Error
	Type for properties are set	Error
	Type for operation param. are set	Error
	Operation return type is set	Error
	Duplicate operations (names + parameter types)	Error
	If interfaces are involved in a ComponentRealization	Warning
Enumeration	Belongs to Java Namespace Root: gives a warning to say that no code will be generated.	Warning
	Does not belong to Java Namespace Root: no check is performed and syntax check is disabled for the enumeration. No check is performed on contained package	None

Syntax check for all UML elements involved in code generation

class	Checks name is a valid Java name (no forbidden characters, name is not a keyword)	Error
class property	Checks name is a valid Java name (no forbidden characters, name is not a keyword)	Error
class operation	Checks name is a valid Java name (no forbidden characters, name is not a keyword) Checks for existence of return parameter	Error
class operation parameter	Checks name is a valid Java name (no forbidden characters, name is not a keyword) Checks type has a valid Java type name	Error
interface	Checks name is a valid Java name (no forbidden characters, name is not a keyword)	Error
interface operation	Checks name is a valid Java name (no forbidden characters, name is not a keyword)	Error
interface operation parameter	Checks name is a valid Java name (no forbidden characters, name is not a keyword)	Error
interface properties	Checks name is a valid Java name (no forbidden characters, name is not a keyword)	Error
package with stereotype namespace	Checks name is a valid Java name (no forbidden characters, name is not a keyword)	Error
package without stereotype namespace	no element to check	None
class	multiple inheritance	Error

Please note:
Constraints on model elements are not checked, as they are not part of the Java code generation process. Please see "constraining model elements" for more information.

Import Source Directory...
Opens the Import Source Directory dialog box shown below.

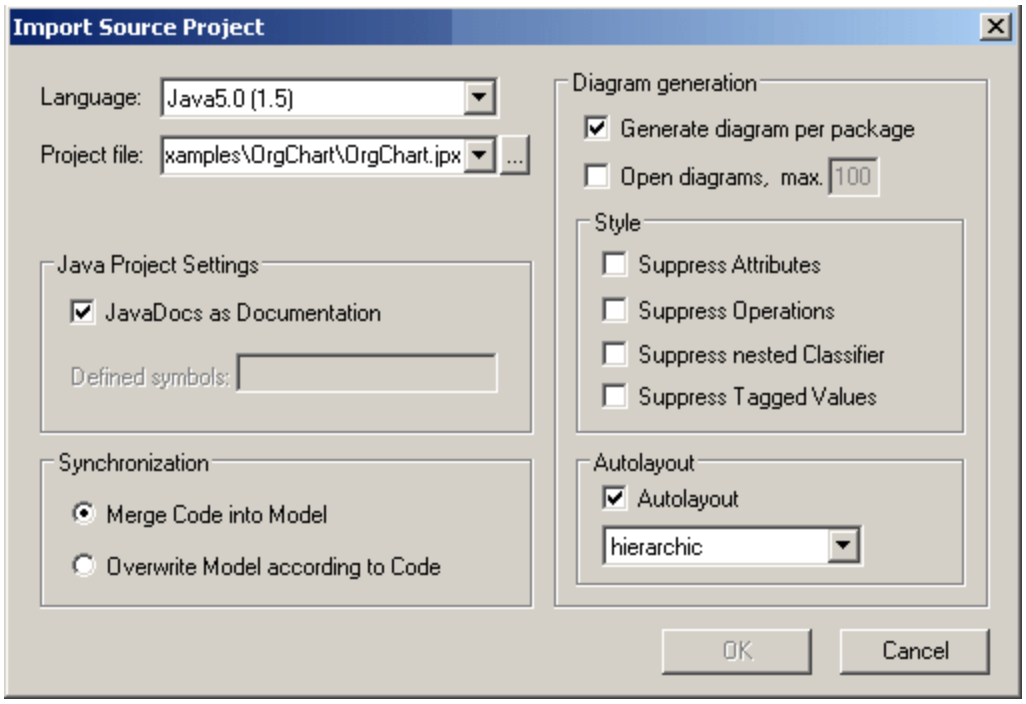


Import Source Project...

Opens the Import Source Project dialog box shown below. Clicking the browse button allows you to select the project file and the specific project type.

Java projects:

- JBuilder **.jpx** and Eclipse **.project** project files are currently supported.



C# projects:

- MS Visual studio.Net projects, **csproj**, **csdprj**..., as well as
- Borland **.bdsproj** project files

Merge Program Code from UModel Project

Opens the Synchronization Settings dialog box with the "**Code from Model**" tab active. Clicking the Project Settings button allows you to select the specific programming language settings.

Merging or overwriting code

Assuming that code has been generated once from a model, and changes have since been made to both model and code e.g.:

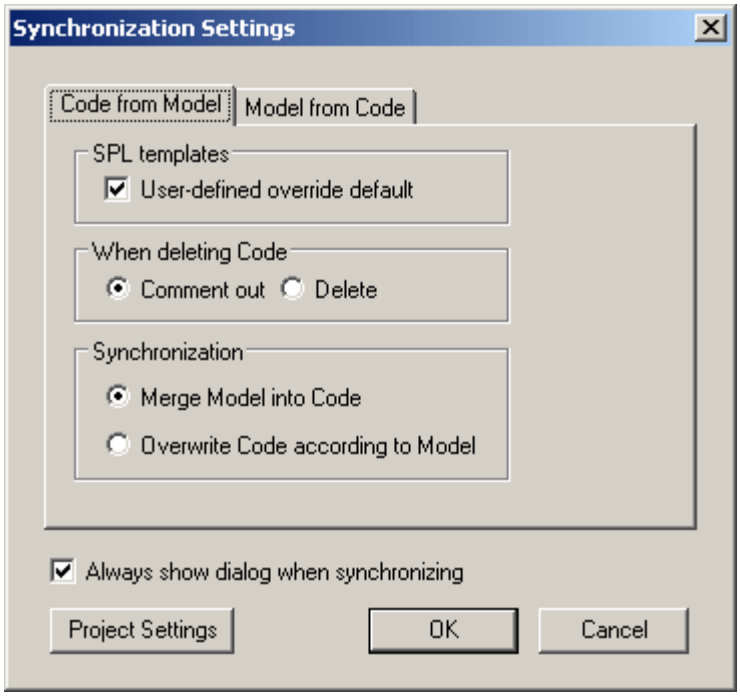
- Model elements have been added in UModel e.g. a new class X
- A new class has been added to the external code e.g. class Y

Merging (model into code) means that:

- the newly added class Y in the external code is **retained**
- the newly added class X, from UModel, is added to the code.

Overwriting (code according to model) means that:

- the newly added class Y in the external code is **deleted**
- the newly added class X, from UModel, is added to the code.



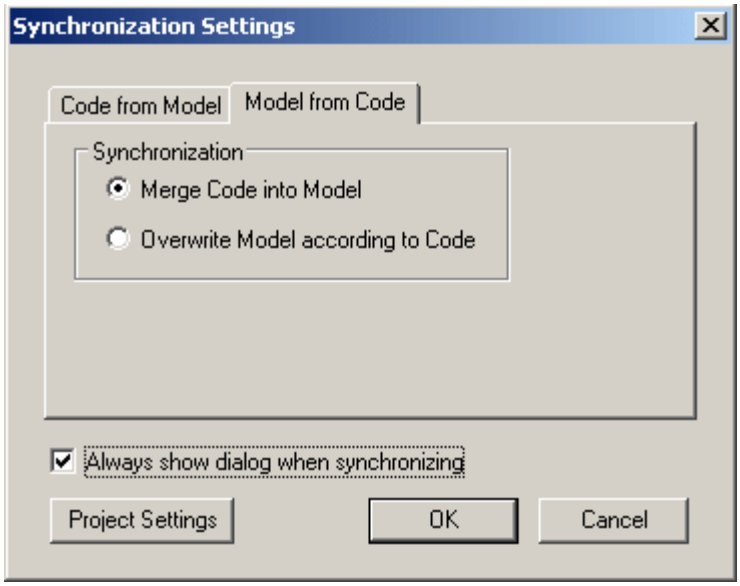
Merge UModel Project from Program Code
Opens the Synchronization Settings dialog box with the "**Model from Code**" tab active. Clicking the Project Settings button allows you to select the specific programming language settings.

Merging or overwriting code
Assuming that code has been generated once from a model, and changes have since been made to both model and code e.g.:

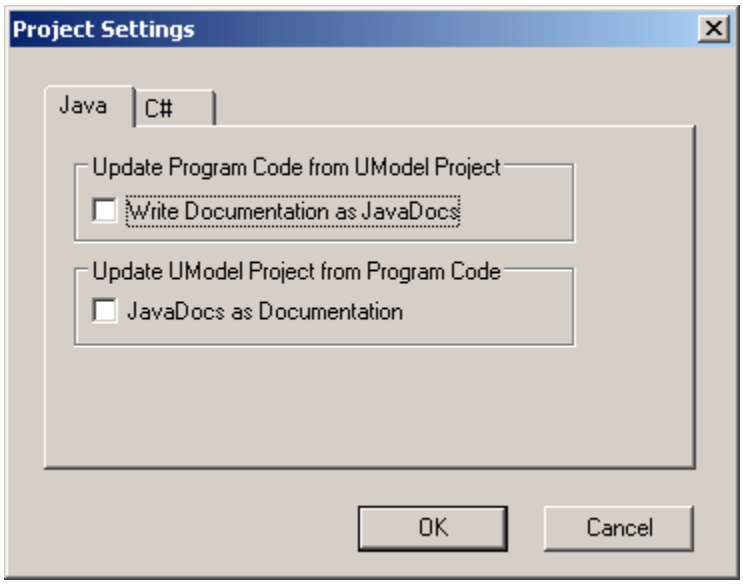
- Model elements have been added in UModel e.g. a new class X
- A new class has been added to the external code e.g. class Y

Merging (code into model) means that:
the newly added class X in UModel, is **retained**
the newly added class Y, from the external code, is added to the model

Overwriting (Model according to code) means that:
the newly added class X in UModel is **deleted**
the newly added class Y, from the external code, is added to the model



Project settings
Allows you to define the specific languages settings for your project.



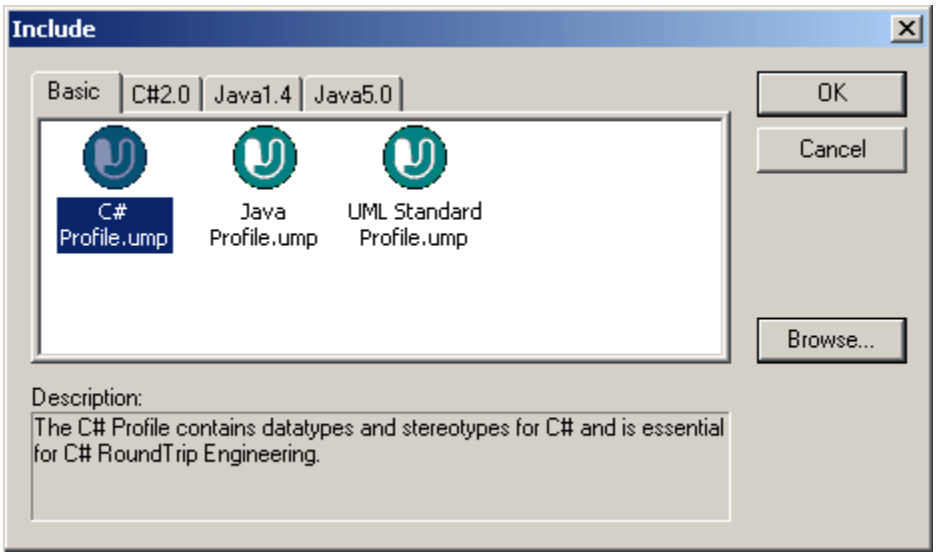
Synchronization Settings...
Opens the Synchronization Settings dialog box as shown in the screenshots above.

Include Subproject
UModel is supplied with several files that can be included in a UModel project. Clicking the Java tab allows you to include Java lang classes, interfaces and packages in your project, by selecting one of the supplied files.

1. Select **Project | Include** to open the "Include" dialog box.
2. Click the UModel project file you want to include and press OK.

UModel projects can be included within other UModel projects. To include projects place the respective *.ump files in:

- ...\UModel2006**UModelInclude** to appear in the Basic tab, or
- ...\UModel2006**UModelInclude\Java** to appear in the Java tab.



Please note:
An include file, which contains all types of the Microsoft .NET Framework 2.0, is available in the C# 2.0 tab.

To create a user-defined tab/folder:

1. Navigate to the ...\UModel2006**UModelInclude** and create/add your folder below ...\UModelInclude, i.e. ...**UModelInclude\myfolder.**

To create descriptive text for each UModel project file:

1. Create a text file using the same name as the *.ump file and place in the same folder. Eg. the **MyModel.ump** file requires a descriptive file called **MyModel.txt.**

To remove an included project:

1. Click the included package in the Model Tree view and press the Del. key.
2. You are prompted if you want to continue the deletion process.
3. Click OK to delete the included file from the project.

Please note:

- To delete or remove a project from the "Include" dialog box, delete or remove the (MyModel).ump file from the respective folder.

Open Subproject as project
Opens the selected subproject as a new project.

Clear Messages
Clears the syntax check and code merging messages, warnings and errors from the Messages window.

List Elements not used in any Diagram
Creates a list of all elements not used in any diagram in the project.

List shared Packages
Lists all shared packages of the current project.

List included Packages
Lists all include packages in the current project. Java Profile (Java Profile.ump) and Java Lang (Java Lang.ump) are automatically supplied in the Bankview example supplied with UModel.

14.4 Layout

The commands of the Layout menu allow you to line up and align the elements of your modeling diagrams.

When using the marquee (drag on the diagram background) to mark several elements, the element with the dashed outline becomes the "active" element, i.e. the last marked element. All alignment commands use this element as the origin, or basis for the following alignment commands.

Align:
The align command allows you to align modeling elements along their borders, or centers depending on the specific command you select.

Space evenly:
This set of commands allow you to space selected elements evenly both horizontally and vertically.

Make same size:
This set of commands allow you to adjust the width and height of selected elements based on the active element.

Line up:
This set of commands allow you to line up the selected elements vertically or horizontally.

Order:
This set of commands allow you bring elements on top or move them to the bottom of a stack of elements.

Line Style:
This set of commands allow you to select the type of line used to connect the various modeling elements. The lines can be any type of dependency, association lines used in the various model diagrams.

Autosize:
This command resizes the selected elements to their respective optimal size(s).

Autolayout all:
This command allows you to choose the type of presentation of the modeling elements in the UML diagram tab. "Force directed", displays the modeling elements from a centric viewpoint. "Hierarchic", displays elements according to their relationships, superclass - derived class etc.

Reposition text labels:
Repositions modeling element names (of the selected elements) to their default positions.

14.5 View

The commands available in this menu allow you to:

- **Switch**/activate tabs of the various panes
- Define the modeling element **sort criteria** of the Model Tree and Favorites tab
- Define the **grouping criteria** of the diagrams in the Diagram Tree tab
- Show or hide specific UML elements in the Favorites and Model Tree tab
- Define the **zoom** factor of the current diagram.

14.6 Tools

The tools menu allows you to:

- Customize your version: define your own toolbars, keyboard shortcuts, menus, and macros
- Define the global program settings

14.6.1 Customize...

The customize command lets you customize UModel to suit your personal needs.

Commands

The Commands tab allows you customize your menus or toolbars.

To add a command to a toolbar or menu:

1. Open this dialog box using **Tools | Customize.**
2. Select the command category in the Categories list box. The commands available appear in the Commands list box.
3. Click on a command in the commands list box and drag "it" to an to an existing menu or toolbar.
4. An I-beam appears when you place the cursor over a valid position to drop the command.
5. Release the mouse button at the position you want to insert the command.

- A small button appears at the tip of mouse pointer when you drag a command. The check mark below the pointer means that the command cannot be dropped at the current cursor position.
- The check mark disappears whenever you can drop the command (over a tool bar or menu).
- Placing the cursor over a menu when dragging, opens it, allowing you to insert the command anywhere in the menu.
- Commands can be placed in menus or tool bars. If you created you own toolbar you can populate it with your own commands/icons.

Please note:

You can also edit the commands in the **context menus** (right click anywhere opens the context menu), using the same method. Click the Menu tab and then select the specific context menu available in the Context Menus combo box.

To delete a command or menu:

1. Open this dialog box using **Tools | Customize.**
2. Click on the menu entry or icon you want to delete, and drag with the mouse.
3. Release the mouse button whenever the check mark icon appears below the mouse pointer.
   The command, or menu item is deleted from the menu or tool bar.

Toolbars

The Toolbars tab allows you to activate or deactivate specific toolbars, as well as create your own specialized ones.

Toolbars contain symbols for the most frequently used menu commands. For each symbol you get a brief "tool tip" explanation when the mouse cursor is directly over the item and the status bar shows a more detailed description of the command.

You can drag the toolbars from their standard position to any location on the screen, where they appear as a floating window. Alternatively you can also dock them to the left or right edge of the main window.

To activate or deactivate a toolbar:

1. Click the check box to activate (or deactivate) the specific toolbar.

To create a new toolbar:

1. Click the **New...** button, and give the toolbar a name in the Toolbar name dialog box.

2. Add commands to the toolbar using the Commands tab of the Customize dialog box.

To reset the Menu Bar

- Click the Menu Bar entry and
- Click the **Reset** button, to reset the menu commands to the state they were when installed.

To reset all toolbar and menu commands

- Click the **Reset All** button, to reset all the toolbar commands to the state they were when the program was installed. A prompt appears stating that all toolbars and menus will be reset.
- Click Yes to confirm the reset.

Show text labels:
This option places explanatory text below toolbar icons when activated.

Keyboard

The Keyboard tab allows you to define (or change) keyboard shortcuts for any command.

To assign a new Shortcut to a command:

1. Select the commands category using the **Category** combo box.
2. Select the **command** you want to assign a new shortcut to, in the Commands list box
3. Click in the "**Press New Shortcut Key**:" text box, and press the shortcut keys that are to activate the command.
   The shortcuts appear immediately in the text box. If the shortcut was assigned previously, then that function is displayed below the text box.
4. Click the **Assign** button to permanently assign the shortcut.
   The shortcut now appears in the Current Keys list box.
   (To **clear** this text box, press any of the control keys, CTRL, ALT or SHIFT).

To de-assign (or delete a shortcut):

1. Click the shortcut you want to delete in the Current Keys list box, and
2. Click the **Remove** button (which has now become active).
3. Click the Close button to confirm all the changes made in the Customize dialog box.

Menu

The Menu tab allows you to customize the main menu bars as well as the (popup - right click) context menus.

You can customize both the Default and **UModel Project** menu bars.
The **Default** menu is the one visible when no XML documents of any type are open.
The **UModel Project** menu is the menu bar visible when a *.ump file has been opened.

To customize a menu:

1. Select the menu bar you want to customize from the "Show Menus for:" combo box
2. Click the **Commands** tab, and drag the commands to the menu bar of your choice.

To delete commands from a menu:

1. Click right on the command, or icon representing the command, and
2. Select the **Delete** option from the popup menu,

or,

1. Select **Tools | Customize** to open the Customize dialog box, and

2. Drag the command away from the menu, and drop it as soon as the check mark icon appears below the mouse pointer.

To reset either of the menu bars:

1. Select either the Default or UModel Project entry in the combo box, and
2. Click the **Reset** button just below the menu name.
   A prompt appears asking if you are sure you want to reset the menu bar.

To customize any of the Context menus (right click menus):

1. Select the context menu from the "Select context menus" combo box.
2. Click the **Commands** tab, and drag the specific commands to context menu that is now open.

To delete commands from a context menu:

1. Click right on the command, or icon representing the command, and
2. Select the **Delete** option from the popup menu

or,

1. Select **Tools | Customize** to open the Customize dialog box, and
2. Drag the command away from the context menu, and drop it as soon as the check mark icon appears below the mouse pointer.

To reset any of the context menus:

1. Select the context menu from the combo box, and
2. Click the **Reset** button just below the context menu name.
   A prompt appears asking if you are sure you want to reset the context menu.

To close an context menu window:

1. Click on the **Close icon** at the top right of the title bar, or
2. Click the Close button of the Customize dialog box.

Menu shadows

- Click the Menu shadows check box, if you want all your menus to have shadows.

Options

The Options tab allows you to set general environment settings.

Toolbar

When active, the **Show Tooltips on toolbars** check box displays a popup when the mouse pointer is placed over an icon in any of the icon bars. The popup contains a short description of the icon function, as well as the associated keyboard shortcut, if one has been assigned.

The **Show shortcut keys in Tooltips** check box, allows you to decide if you want to have the shortcut displayed in the tooltip.

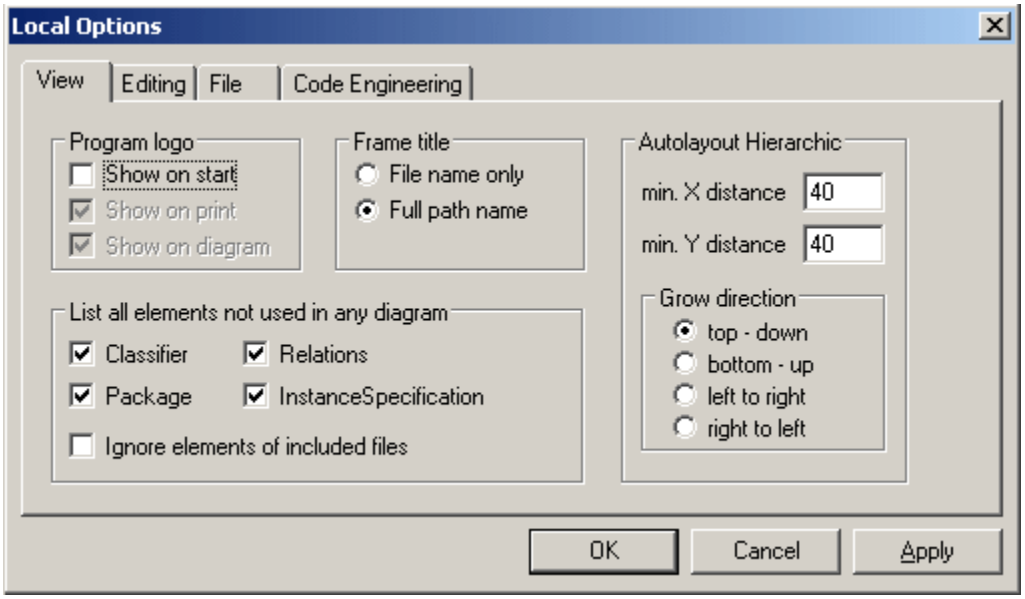
When active, the **Large icons** check box switches between the standard size icons, and larger versions of the icons.

14.6.2 Options

Select the menu item **Tools | Options** to define your project options.

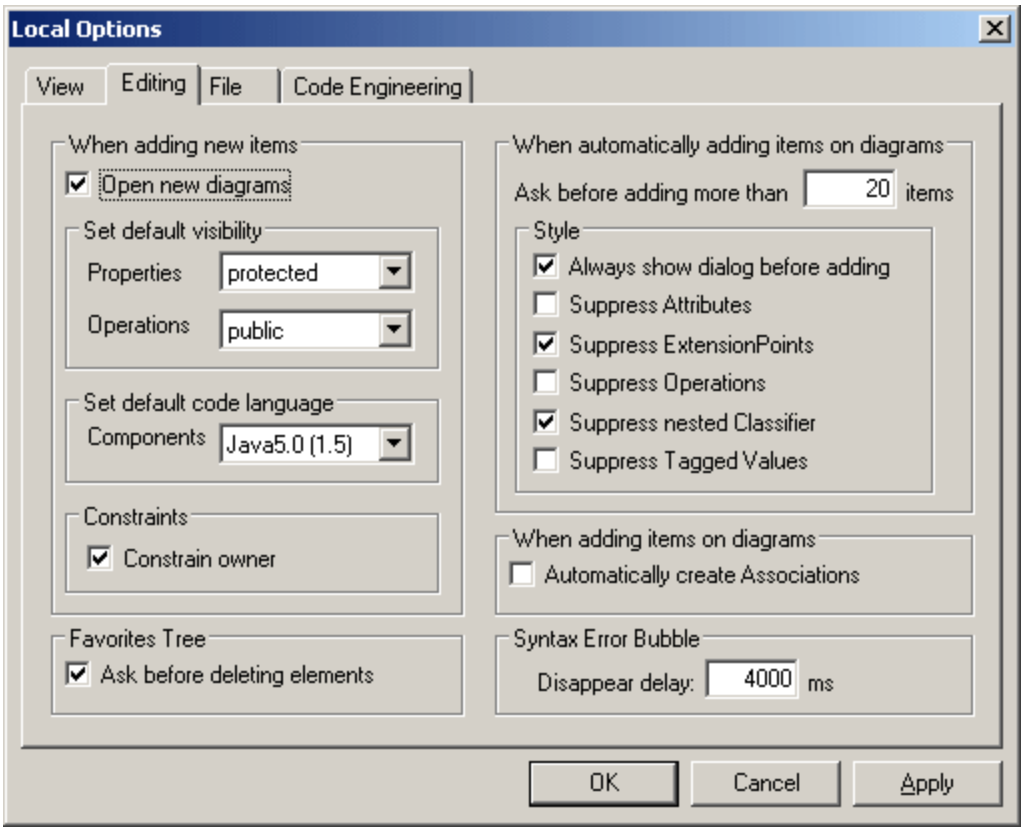
The **View** tab allows you to define:

- Where the program logo should appear.
- The application title bar contents.
- The types of elements you want listed when using the "List elements not used in any diagram" context menu option in the Model Tree, or Favorites tab. You also have the option of ignoring elements contained in **included** files.
- Autolayout settings.



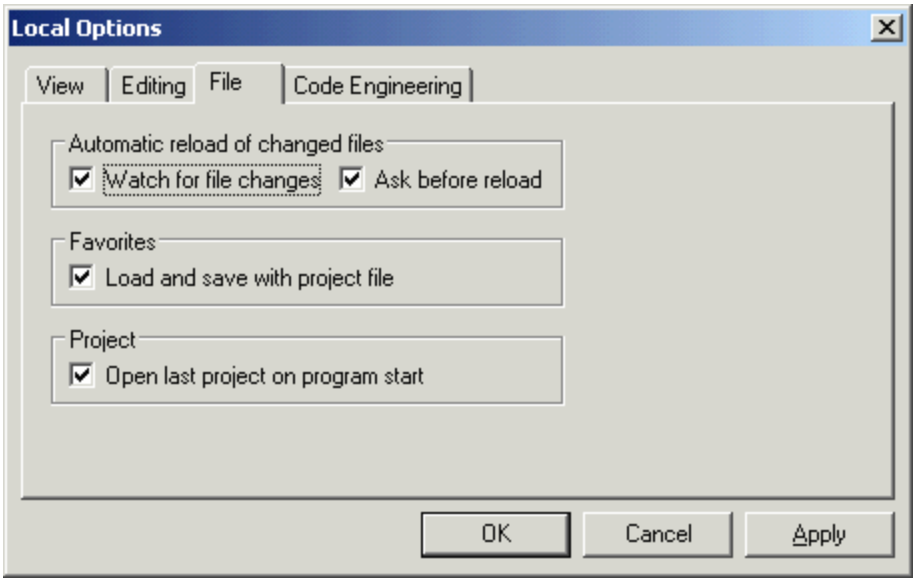
The **Editing** tab allows you to define:

- If a new Diagram created in the Model Tree tab, is also automatically opened in the main area.
- Default visibility settings when adding new elements.
- The default code language when a new component is added.
- If a newly added constraint, is to automatically constrain its owner as well.
- If a prompt should appear when deleting elements out of the **Favorites** tab (tree). This prompt can be deactivated when deleting items there; this option allows you to reset the "prompt on delete" dialog box.
- The display of Styles when they are automatically added to a diagram.
- If Associations between modeling elements, are to be created automatically when items are added to a diagram.



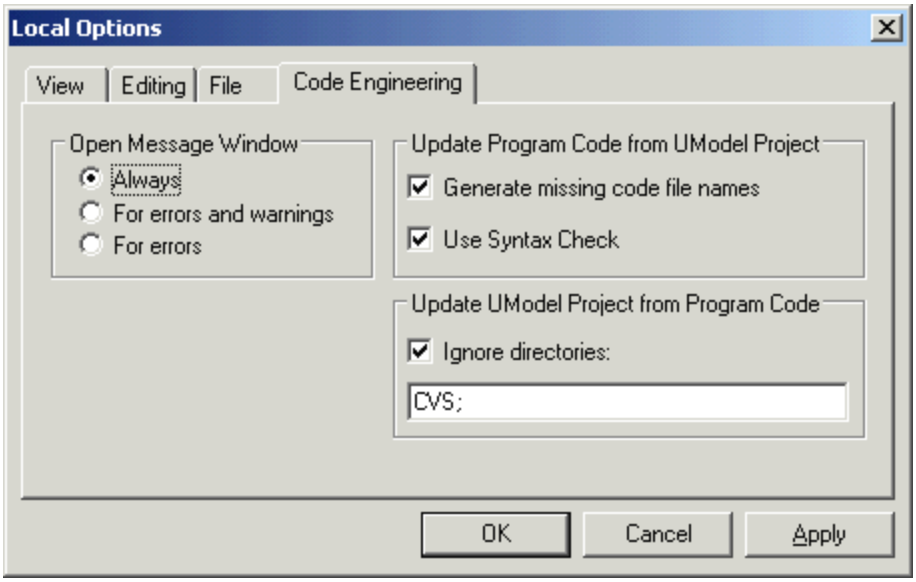
The **File** tab allows you to define:

- The actions performed when files are changed.
- If the contents of the Favorites tab are to be loaded and saved with the current project.
- If the previously opened project is to automatically be opened when starting the application.



The **Code Engineering** tab allows you to define:

- The circumstances under which the Message window will open.
- If missing code file names in the merged code are to be generated.
- If a syntax check is to be performed when updating program code.
- directories to be ignored when updating a UModel project from code, or directory. Separate the respective directories with a semicolon "**;**". Child directories of the same name are also ignored.



14.7 Window

Cascade:
This command rearranges all open document windows so that they are all cascaded (i.e. staggered) on top of each other.

Tile horizontally:
This command rearranges all open document windows as **horizontal tiles**, making them all visible at the same time.

Tile vertically:
This command rearranges all open document windows as **vertical tiles**, making them all visible at the same time.

Arrange icons:
Arranges haphazardly positioned, iconized diagrams, along the base of the diagram viewing area.

Close:
Closes the currently active diagram tab.

Close All:
Closes all currently open diagram tabs.

Close All but Active:
Closes all diagram tabs except for the currently active one.

Forward:
Switches to the next modeling diagram in the tab sequence.

Back:
Switches to the previous modeling diagram in the tab sequence.

Window list:
This list shows all currently open windows, and lets you quickly switch between them.

You can also use the Ctrl-TAB or CTRL F6 keyboard shortcuts to cycle through the open windows.

14.8 Help

Allows access to the Table of Contents and Index of the UModel documentation, as well as Altova web site links. The Registration option opens the Altova Licensing Manager, which contains the licensing information for all of Altova products.

Chapter 15

Appendices

15 Appendices

These appendices contain technical information about UModel and important licensing information.

License Information

- Electronic software distribution
- Copyrights
- End User License Agreement

15.1 License Information

This section contains:

- Information about the distribution of this software product
- Information about the copyrights related to this software product
- The End User License Agreement governing the use of this software product

Please read this information carefully. It is binding upon you since you agreed to these terms when you installed this software product.

15.1.1 Electronic Software Distribution

This product is available through electronic software distribution, a distribution method that provides the following unique benefits:

- You can evaluate the software free-of-charge before making a purchasing decision.
- Once you decide to buy the software, you can place your order online at the Altova website and immediately get a fully licensed product within minutes.
- When you place an online order, you always get the latest version of our software.
- The product package includes a comprehensive integrated onscreen help system. The latest version of the user manual is available at www.altova.com (i) in HTML format for online browsing, and (ii) in PDF format for download (and to print if you prefer to have the documentation on paper).

30-day evaluation period
After downloading this product, you can evaluate it for a period of up to 30 days free of charge. About 20 days into this evaluation period, the software will start to remind you that it has not yet been licensed. The reminder message will be displayed once each time you start the application. If you would like to continue using the program after the 30-day evaluation period, you have to purchase an End User License Agreement, which is delivered in the form of a key-code that you enter into the Registration dialog to unlock the product. You can purchase your license at the online shop at the Altova website.

Distributing the product
If you wish to share the product with others, please make sure that you distribute only the installation program, which is a convenient package that will install the application together with all sample files and the onscreen help. Any person that receives the product from you is also automatically entitled to a 30-day evaluation period. After the expiration of this period, any other user must also purchase a license in order to be able to continue using the product.

For further details, please refer to the End User License Agreement at the end of this section.

15.1.2 License Metering

Your Altova product has a built-in license metering module that helps you avoid any unintentional violation of the End User License Agreement. Your product is licensed either as a single-user or multi-user installation, and the license-metering module makes sure that no more than the licensed number of users use the application concurrently.

This license-metering technology uses your local area network (LAN) to communicate between instances of the application running on different computers.

Single license
When the application starts up, it sends a short broadcast datagram to find any other instance of the product running on another computer in the same network segment. If it doesn't get any response, it will open a port for listening to other instances of the application. Other than that, it will not attempt to communicate over a network. If you are not connected to a LAN, or are using dial-up connections to connect to the Internet, the application will not generate any network traffic at all.

Multi license
If more than one instance of the application is used within the same LAN, these instances will briefly communicate with each other on startup. These instances exchange key-codes in order to ensure that the number of concurrent licenses purchased is not accidentally violated. This is the same kind of license metering technology that is common in the Unix world and with a number of database development tools. It allows Altova customers to purchase reasonably-priced concurrent-use multi-user licenses..

Please note that your Altova product at no time attempts to send any information out of your LAN or over the Internet. We have also designed the applications so that they send few and small network packets so as to not put a burden on your network. The TCP/IP ports (2799) used by your Altova product are officially registered with the IANA (*see* http://www.isi.edu/in-notes/iana/assignments/port-numbers *for details*) and our license-metering module is tested and proven technology.

If you are using a firewall, you may notice communications on port 2799 between the computers that are running Altova products. You are, of course, free to block such traffic between different groups in your organization, as long as you can ensure by other means, that your license agreement is not violated.

You will also notice that, if you are online, your Altova product contains many useful functions; these are unrelated to the license-metering technology.

15.1.3 Copyright

15.1.4 Altova End User License Agreement

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